Public Comment on the Onondaga County Cost Comparison of Paper Ballot Optical Scan And Direct Recording Electronic Voting Systems

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For New Yorkers for Verified Voting

Onondaga County Executive Nicholas Pirro last Fall asked the County Comptroller and the Chief Fiscal Officer jointly to develop an estimate for the cost to the county of each of the two voting systems authorized under New York's Election Reform and Modernization Act (2005).   This joint study, published on April 19, 2007, compares estimates of costs developed by the Board of Elections, the League of Women Voters, and the "Study Group" that prepared the study. [2] The executive summary of the Report speaks of the "widely divergent estimates" submitted by Onondaga County's Board of Elections (BOE) and the Onondaga County League of Women Voters (LWV).

New Yorkers for Verified Voting (NYVV) appreciates the consideration offered by the County Executive and the Study Group to the cost issues involved in voting system selection. We need, however, to call attention to omissions and misinterpretations in the Study Group's analysis as well as to additional relevant issues. A large body of research and analysis about voting systems has developed. The Comptroller, Division of Management and Budget, and Study Group may not have had time to read and analyze much of this information.

Executive Summary

In this public comment, first, New Yorkers for Verified Voting will call attention to some costs that were omitted from the Report, probably because neither the Board of Elections nor the League of Women Voters considered them. Some of these costs (e.g., storage, transportation, peripheral equipment, pre-election testing) can be estimated now. Others (software, maintenance) cannot be estimated closely until the state negotiates contracts with vendors. Nevertheless, these major costs need to be recognized now; too often counties do not note them until a system has been chosen and they begin to implement it. [3] In each case, NYVV finds that including the omitted costs would reveal cost advantages of the paper ballot scanner system (PBOS) over direct recording electronic voting machines (DREs).

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This document can be downloaded at http://www.nyvv.org/newdoc/county/CmtsOnondagaCostRpt.pdf

[2] This document, titled "Cost Comparison of Optical Scanning and Digital Recording Electronic Devices" submitted on April 19, 2007, will be referred to here as the "Report." The Report's title names the two voting systems "Digital Recording Electronic" and "Optical Scanning," However, we use the more common names for the two voting systems (as above, in our title). The acronym "DRE" usually is explained as *Direct* Recording Electronic Voting Machine (DRE). The point is that votes are registered *directly* in electronic circuits. In what NYVV prefers to call *the paper ballot optical scanner* system (PBOS), votes are recorded *directly* on a paper ballot by the voter and the scanner is a ballot counter.

[3] For example, see recent reports that counties now are discovering exorbitant costs for extending the warranty for machines purchased for 2006. Mercer County PA faces paying $55 per year per machine plus service technician charges to ES&S. See Mary Grzebieniak, "Mercer County asks for help with voting machines," July 19, 2007, http://www.vindy.com/content/local_regional/306720742984876.php

Second, we will comment on disputed costs that the Report does analyze: numbers of direct recording electronic (DREs) machines needed, numbers of privacy booths needed with the paper ballot scanner system, and the cost of paper ballots. Again, in each case NYVV indicates clear evidence that the paper ballot scanner system is an economically wise choice.

Finally, we will comment on issues raised in the Report's paragraph on "Other Findings" (page 5). This paragraph's conclusions about reliability, usability, and costs are based on "conversations with election officials throughout the country." However, the sample of election officials selected does not surface some widely known evidence. We will point to this missing evidence to show that the paper ballot scanner system provides both financial and operational advantages over DREs.

We also will argue that Onondaga County should not purchase electronic technology without considering the testimony of experts. While election officials bring managerial expertise to our topic, most are not trained in computerized technology. They usually have been dependent upon voting equipment vendors for information about it.

Prefatory note: The data used both in the Report and much that is used in the following analysis does not include some recent developments. For example, the voting machines discussed are those demonstrated prior to the middle of May 2007. Some new equipment apparently is being developed and may be submitted for New York State certification.

I. Costs Omitted From the Estimates

A. Software [4]

A major cost missing from all three estimates (those from the Onondaga County Board of Elections, the League of Women Voters, and the Study Group) is for software purchase and maintenance. This includes costs for Election Management Systems that enable centralized functions, e.g., ballot programming. It also includes charges for poll site software contracts.

Software contracts can affect both acquisition and operating costs for both the paper ballot scanner system and for DREs. That effect, however, will be larger on direct recording electronic voting machines, both because of the way vendors levy charges and because more machines are required with DREs. With many fewer machines, the on-going software and maintenance cost would be significantly less for the paper ballot scanner system.

Two additional factors support our claim that software for the paper ballot scanner system will be less expensive than for DREs: (1) some scanners include software costs in the basic acquisition price, making additional charges for software and maintenance only after five years.[5] (2) The most popular ballot marker includes the software cost in the acquisition price.[6]

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[4] Software estimates have been based on explanations by vendors at demonstrations (e.g., on May 1, 2007, at the BOE Conference in East Syracuse). They also have been extrapolated from the detailed bids from vendors that are on the website for the New York City Board of Elections at http://www.vote.nyc.ny.us/rfi.html. In the case of LibertyVote/Nedap, they are based on materials published by the vendor, since it has no bid on this site.

[5] In its bid to New York City Diebold says that the software is included in the acquisition cost of the AccuVote-OS and that there is an "AccuVote-OS Voting system Annual Warranty (effective post-year 5)" of $168.00 per machine." See http://www.vote.nyc.ny.us/rfi.html New York City BOE Voting system - Cost Response, Diebold Election System, Inc., Bill of Materials - Optical Scan, page 1; also Lever Replacement Solution: Optical Scan Pollsite System, page 10.

[6] No separate software charge is listed for the AutoMARK in the NYC bids by vendors that use it for PBOS accessibility. Agents for Diebold have said the software was included in the purchase charge for the AutoMARK.

Some different ways vendors levy software and maintenance costs:

- **Sequoia Voting Systems** charges $0.85 per active voter for software purchase/maintenance, whether for its Advantage Plus DRE or for its scanner.[7]
- **LibertyVote/Nedap** charges 12% of the acquisition costs annually for its DRE. Acquisition costs would include charges for the peripheral equipment noted below.
- **Avante** charges $600 per machine for pollsite software for its DRE.[8] In addition, central site software is needed for programming each election. New York City apparently purchased central software for Plan B; otherwise the contract for them would be $30,000. With Avante, there is a "per unit"/machine charge ($90) for annual software maintenance from 2008 onward as well as a per machine pollsite maintenance charge of $300.[9]
- Implied in the NYC bid for the ES&S M100 scanner is a Central Site Software charge of approximately $65.00 per pollsite (for scanner and AutoMARK together). ES&S lists no annual software maintenance charge for this PBOS equipment until after the initial five years.[10]
- **ES&S** recently announced a plan to change its fee structure so that it is based on the number of active voters in the county.[11]
- The **Diebold AccuVote-OS** scanner calls for a Central Site Software purchase cost for NYC that would imply about $180 per scanner.[12]
- The **Dominion** scanner from Canada has an accessible ballot marking device included with the scanner; and the software cost for this is not separate.[13]

B. Transportation and Storage

During the same period of time when HAVA has asked for purchase of new voting equipment, New York has instituted centralization of election management. Counties now will have additional costs for storing machines in a central location and transporting them to pollsites. The fact that the Report omits costs for transportation and storage of voting equipment erases substantial cost advantages of the paper ballot scanner system.

The equipment for **the paper ballot scanner system** is much more manageable by average election workers than DREs.

- It takes much less space in a van or truck as well as in storage.
- Scanners and ballot markers are small, light,[14] come with hard cases, and can be stored on shelves or wheeled racks.

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[7] This is from several sources, but see also pages 9 and 14 of Cost Response Sequoia Op Scan.xis at http://www.vote.nyc.ny.us/rfi.html.

[8] http://www.vote.nyc.ny.us/rfi.html, "Software Expenses Not Included in Other Unit Costs" on table of "One-Time Costs for Avante Full-Face Vote-Trakker," page 14.

[9] http://www.vote.nyc.ny.us/rfi.html, Avante Cost Response section "On-going Commodities Costs (2008 onward), page 8.

[10] http://www.vote.nyc.ny.us/rfi.html, ES&S NYC BOE Cost Response.xis, page 10.

[11] Discussed by ES&S agents at the Pacific Northwest Elections conference, June 26-29, 2007, Portland, Oregon. See, e.g., http://blip.tv/file/287120.

[12] http://www.vote.nyc.ny.us/rfi.html, Cost Response Diebold Op Scan.xis, page 5.

[13] Sequoia and Dominion agents at East Syracuse, May 1, 2007.

[14] Ballot scanners weigh between 19 and 39 lbs.; the AutoMARK ballot marker weighs 48 lbs. and can be rolled on a wheeled cart and easily lifted onto a table by two poll workers or machine custodians.

- Ballot boxes are on wheels and folding privacy screens and adjustable folding tables are light and compact. This equipment is not fragile and requires no specialized maintenance.

In contrast, it is clear that transportation and storage would be more expensive for the **Direct Recording Electronic system.**

- Full-face touch-screen DREs like those made by Sequoia and Avante, would require specialized equipment for transportation to and from polling places, probably a truck with a hydraulic lift. They also would require specialized labor.
- The Sequoia Advantage Plus weighs approximately 350 lbs; Sequoia says that it has wheels and one person can roll it. Sequoia also says it has handles, but that it would take four or more people to lift it.[15] The Sequoia Advantage is 67"x 29" x 40 (h) in the storage position.
- The specifications for the Avante Vote-Trakker DRE are comparable to the Sequoia Advantage. It also weighs approximately 350 pounds. Its dimensions, when closed for storage and transportation, are 60"x 30" x 70. " It also has casters for rolling and handles for lifting or moving.
- The LibertyVote/Nedap DRE might seem compact by comparison, since in its original form the machine folded into a case. But addition of the voter verifiable paper audit trail has made storage, transportation, and set-up much more complex. An observer of the set-up of the uncertified Liberty at the Troy school elections on May 15, 2007 saw two additional cases in which equipment was transported. The printer is a separate unit that must be attached at the polling places. In addition, a blue canvas bag, approximately 2.5 feet x 12 inches serves as a receptacle for the slips of paper from the paper audit trail. Both privacy curtains and accessibility devices are transported separately from the machines and assembled at the polling place.

C. Peripheral Equipment Omitted From the Estimate

The Onondaga County Report has roughly estimated some of the peripheral acquisition and operating costs for the two systems, but more detail is supplied for the paper ballot scanner system than for DREs. Missing from the DRE estimate is the cost of some necessary accessories. For example,

- Added to the $8,900 basic unit cost for the **Avante** would be an Encoder for the voter access cards ($600), the Voter Access Cards themselves, accessible devices for the disabled ($380), and the battery ($160).[16]
- A 2005 price list for the **Liberty Vote** system provides a summary indication of some of the costs beyond the machine itself (printer and programming unit add up to $1400). In addition, the large paper ballot face for each machine has been estimated at a $50 printing and paper cost for each election.
- The **Sequoia DRE** has less peripheral equipment, but it demands more labor and training from election workers, since, for example, the pollworker must set the machine for each voter to the correct election district as well as for any special accessibility devices.
- **In New York, all DREs are required to provide a voter verifiable paper trail (VVPAT)**. In Carson City, Nevada, this has brought added costs for specialized training

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[15] http://www.vote.nyc.ny.us/rfi.html, Sequoia Voting Systems, "A Report for the Board of Elections in the City of New York (Nov. 2006). Technical Clarification, NYC Advantage Response, page 4.

[16] http://www.vote.nyc.ny.us/rfi.html, Avante Cost Response, "One-Time System Costs Based on 10,000 Full Face Touch Screen DRE with VVPB," 6.

of workers to change the paper rolls needed for the paper trail.[17] Some VVPATs require a new roll for every 100 – 125 voters. Because the process was deemed too difficult for poll workers, Cheyenne County, Colorado reduced the font size so that poll workers would not have to change the roll.[18] Of course, this was only possible because the number of registered voters per DRE on Election Day was limited to 213 (see the discussion below of the number of machines required).

D. Example of Labor Costs Omitted: Logic and Accuracy Testing

Usually the increased labor costs with electronic voting are assumed to be caused by the need for computer and software technicians. Such costs are significant; the New York City bids cited above testify to the kind of expenses that might be involved. However, the labor costs involved in pre-election testing of machines at the local level exemplify additional non-technological costs omitted from the Report.[19] Logic and accuracy tests for DREs require that each vote be entered into each machine the required number of times. By contrast, testing of scanners can be done by inserting the test ballot (with all of the votes) in each scanner. John Washburn, cryptographer and statistician, argues that testing of DREs is twice as expensive as PBOS.

We should acknowledge that the ballot marking devices for the PBOS system also must be tested; but there is usually only one per polling place. There will be more DREs and the accessibility features as well as the usual Logic and Accuracy tests must be checked on each before each election.

II. Disputed Costs

A. Number of DREs

The Onondaga County Report says: "Based on the experiences in other communities, we believe the County would need one DRE per election district." Inasmuch as election districts usually have been based on the maximum number of voters allowed per lever machine (800), this recommendation might lead to very long lines during peak voting times. Machines need to be distributed in terms of the number of active voters in a district, rather than simply by election districts.

The NY State Board of Elections now has posted recommended maximums for number of active voters per DRE, setting that number at 550.[20] This number is not final, since a public comment period is surfacing some serious challenges to this recommendation. The NY State Board of Election also is mandating that no voter be required to wait in line for more than thirty minutes.

Now that the state Board of Elections has posted recommendations with regard to numbers of DREs, Onondaga County surely will re-visit the question of the number of DREs required. This reconsideration might well review the findings of the American Institutes for Research (AIR) in the study sponsored by the NY Board of Elections. In the AIR study, the estimated Maximum Daily Rate (MDR), based on the mean number of pollsite voters on DREs, range

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[17] Alan Glover, County Clerk, Carson City, NV.

[18] Kay Feyh, County Clerk, Cheyenne County, Colorado.

[19] See Washburn's articles linked through "Election Integrity" at http://www.washburnresearch.org. Some also are linked from the home page at http://www.votersunite.org .

[20] New York State Election Law Proposed Section 6210.19, http://www.elections.state.ny.us/NYSBOE/hava/Voting_Machines/ProposedMinimumNumVotingMachine.pdf.

from 207 (Sequoia) to 295 (Liberty). [21] The AIR study may have been flawed in some respects, but its maximums are much more realistic than those recommended either by the State Board or by the Onondaga County Report.

There is compelling evidence that long lines during peak voting times can be avoided only with a much lower maximum of active voters per DRE. [22]   NYVV has recommended 200 as the maximum on the basis of mathematical analysis and queuing theory as well as the practice in other states of having one DRE for every 200-300 registered voters. [23]

Use of DREs requires more machines than the PBOS system for numerous reasons, including:

- Only one person can vote at a time on a DRE.
- Persons with special needs also would use the same DRE, sometimes requiring 20-40 minutes to set up the equipment and vote.
- By contrast, with PBOS, many voters can mark ballots simultaneously in privacy booths, either by hand or with the ballot marker.
- As the Report acknowledges, with PBOS, the scanning of the marked ballots is done in a matter of seconds.
- If each DRE must serve as many as 550 voters, paper (for the Voter Verifiable Paper Audit Trail) may need to be re-filled and/or receptacles may need to be emptied during Election Day, causing machine downtime. The ballot boxes with the scanners may also need to be emptied, depending on the type ordered and the voter turn-out, but some hold as many as 3,000 ballots.

B. Number of Privacy Booths

It is surprising that the Report advocates six privacy booths[24] for each polling place with PBOS, but only one DRE per election district. The time used in a privacy booth to mark a ballot should be no more, and probably would be less, than the time required in a DRE. This is true for several reasons including the fact that voter-marked paper ballots do not require a separate step for verification.

One advantage of PBOS, of course, is that persons with special needs could take the time they need in the booth with the ballot marker without the pressure of lines of other voters waiting. For other voters, NYVV recommends a marking booth for each 200 active voters. Experiences in other states have shown that having multiple privacy booths with the paper ballot scanner system prevents the long waiting times that pose hardships for voters who

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[21] American Institutes for Research (AIR) Draft Research Report, "New York State Voter System User Rate Assessment Study," December 11, 2006, http://www.elections.state.ny.us.

[22] William A. Edelstein, "New Voting Systems for NY - Long Lines and High Cost," http://www.nyvv.org/doc/voterlines.pdf; also "Estimating the Number of Voting Machines for New York State's Polling Places," http://www.nyvv.org/newdoc/VotingMachineNumbersForNYS.pdf , and "New York State Board of Elections Proposal for Number of Voters per Machine Guarantees Long Lines and Voter Disenfranchisement," March 26, 2007, http://www.nyvv.org/doc/Resp070326.pdf.

[23]See Marge Acosta, "Survey Data on the Number of Voters per DRE in Other State Jurisdictions," http://www.nyvv.org/newdoc/StateTimingData.pdf . Also see, e.g., Report from Montgomery County, MD, "Lessons Learned: 2004 Presidential General Election Review." This county deployed one DRE for each 200 voters, but experienced in some places long lines due to machine breakdowns. The Report recommends adding one machine to each poll site unless breakdown rate goes down. See pp. 10, 12, 14, and 16. Also note policies in Ohio, which recommend one DRE per 175 voters. See "The Longest Lines: An Unsettled Crisis in Our Voting System," Roosevelt Institution, http://kenyon.rooseveltinstitution.org/vote/.

[24] The Report mentions "small, table-mounted, partitions" as an alternative to privacy booths. If such partitions are workable to guarantee privacy in a particular polling place, they would cost much less than $235 each.

must get to work or arrange for child care or transportation.[25] For the same reason, multiple DREs would be needed in virtually all election districts.

C. Cost of Paper Ballots

The Report claims that the cost of paper ballots makes a "significant and decisive difference in the operating costs of the two systems." While we appreciate the fact that the Onondaga County Study Group estimated a more reasonable charge per ballot ($0.50) than is usually cited by commissioners and vendors, New Yorkers for Verified Voting has obtained information from printing and printer companies that makes it clear that even that high a cost is unnecessary and that the cost of paper ballots need not be decisive.[26]

A new study by Marge Acosta of New Yorkers for Verified Voting, "Facts About Ballot Printing Costs," presents evidence that high prices for ballots will not be necessary even for New York's complex ballot with its tear-off stub.[27] Attached to the Acosta study are estimates from printing companies for 14 cents or 29 cents per ballot for Suffolk County. One company quotes the average cost for other, smaller counties as 32 cents per ballot.

Even more promising is the new alternative being pursued by some counties: **in-house printing using county-owned or regionally-shared digital printers**. Acosta has demonstrated per ballot costs with this alternative as low as $0.06 (6 cents). Besides reduced costs, this arrangement allows Boards of Elections more independence from the vendors as well as printing companies in meeting deadlines and dealing with last minute changes.[28]

Additional matters to keep in mind with regard to the cost of paper ballots:

- New York election officials have said that HAVA funds could be used to purchase printers that produce ballots that meet state requirements.

- The many cost comparisons that have shown higher operating costs with the use of DREs than with PBOS (see, e.g., footnotes #30-36) already had included the cost of paper ballots in these comparisons.

- A number of the election reform bills introduced into Congress call for having emergency ballots in ample quantities available in each polling place, and/or for strengthened arrangements for provisional ballots, and/or for no-excuse absentee voting (see http://www.federalelectionreform.com). All of these laws, if adopted, would require more paper ballots, even with DREs. While some New York election officials have said that they are required to order ballots only from certain printing companies or from vendors, there is no such requirement.

- The Study Group Report does not take into account the strong recommendations that DRE systems have ample paper ballots in each precinct in case there are machine failures. New York's regulations call for a "contingency plan" (see 6210.11 J) and available emergency ballots.

- The Report does not take into account that, even with DREs, election workers must be paid for hours of labor to prepare paper ballots for absentee, military, provisional,

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[25]Robert Millman, "Bought and Sold: Electronic Voting in New York." This DVD reports on Lee, MA.

[26] For example, see "Paper Ballot Costs and Printing," http://www.nyvv.org/reports/PaperBallotPrintingCosts.pdf.

[27] Marge Acosta, "Facts About Ballot Printing Costs,"
http://www.nyvv.org/newdoc/ballotcost/FactsAboutBallotCosts.pdf

[28] "Summit ponders printing ballots," Lisa A. Abraham, 1/3/2007
http://www.wheresthepaper.org/AkronBeaconJournal061210SummitPondersPrintingBallots.htm

and emergency use. With the paper ballot scanner system all voters in the same jurisdiction use the same ballot, adding no labor hours to those already required to prepare ballots for these circumstances.

III. NYVV Comments on "other findings" of the report

The Report's paragraph on "Other Findings" (page 5) argues that "conversations with election officials throughout the country" indicate that "both systems are reliable, relatively inexpensive to maintain, and acceptable to voters." This is surprising given the widespread reports of problems with the new technologies, both with costs and with reliability.[29]

A. Findings about Costs

The Onondaga County Report predicts that operating costs for the two systems, other than those for paper ballots, will be "reasonably similar" (page 5). This contradicts the experiences widely reported from other states that have found exorbitant operating costs with DREs, in some cases causing jurisdictions to consider changing to the PBOS system even when HAVA funds for machine acquisition already have been spent.[30] Governor Robert L. Ehrlich of Maryland wrote to their state Board of Elections on Feb 15, 2006 that the state had experienced a 1000% increase in the estimated budget for annual maintenance costs with their DRE system.

Among the many reports[31] that DREs far exceeded predicted operating costs is this from one election commissioner:

> From $295- encoders, which program the machines, to $307-cartridges, which print a paper trail, the new electronic voting machines have extra costs involved—costs the county has to pay. "Nobody had told us about all the expenses...We've got to buy the necessary equipment" ...and "We need to train poll workers."[32]

John Gideon epitomizes the experience counties have had with operating costs through the title of his article reporting on the experience of Salt Lake County: "New Voting Machines: The Gift That Keeps on Costing." [33] Although HAVA "gives" the machines, the mayor of Salt Lake County said technical support and storage cost the county "millions and millions" of dollars.

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[29]For questions about "reliability," see, e.g., "Electronic Voting: a Failed Experiment," http://www.votersunite.org/info/DREFailedExperiment.pdf . Also see "Officials Wary of Electronic Voting Machines," http://www.nytimes.com/2006/09/24/us/politics/24voting.html?ex=1316750400&en=af05de97347b6bb3&ei=5088&partner=rs

[30] "Miami Dade County Officials Recommend Scrapping DRE Systems for Optical Scanners," http://www.nyvv.org/reports/MiamiDadeDumpsDREs.pdf ; also Terry Oblander and Angela Townsend, "Special elections cost whether taxes pass. "Charges for touch-screen machines going up", http://wheresthepaper.org/PlainDealer070113ChargesForTouchScreensGoingUp.htm.

[31] See cost comparisons linked from the home page at http://www.votersunite.org: Rosemarie Myerson has published studies of counties in Florida and Joyce McCloy of counties in North Carolina. Also see http://www.verifiedvotingfoundation.org/downloads/New%20vvpbcosts.pdf . .

[32] "County election costs to get higher," by Katie Stallcup, The Natchez Democrat, May 13, 2007. http://www.democraticunderground.com/discuss/duboard.php?az=view_all&address=203x472265#472292

[33]John Gideon, "New Voting Machines: The Gift That Keeps On Costing," 12/ 09/ 2006, http://votetrustusa.org/index.php?option=com_content&task=view&id=2108&Itemid=113. See also a report from Luzerne County in PA, Michael P. Buffer, "E-voting machines will cost $250,000 in maintenance," 11/04/2006 http://www.citizensvoice.com/site/news.cfm?newsid=17421646&BRD=2259&PAG=461&dept_id+455154&rfi=6. And see John Mazzolini, "Election success cost an extra $17 per voter," Cleveland Plain Dealer, 11/09/2006, http://wheresthepaper.org/PlainDealer061109ElectionSuccessCostExtra17PerVoter.htm More recently from NJ: Bergen County: Oshrat Carmiel, "Bergen cranks up AC for e-voting machines," 07/03/07, http://www.northjersey.com/page.php?qstr=eXJpcnk3ZjczN2Y3dnFlZUVFeXkzJmZnYmVsN2Y3dnFlZUVFeXk3

In Ohio, one county commissioner said on learning the proposed terms for service contracts from vendors, "This completely blind-sided the county... It's kind of a back-door expense that no one saw coming."[34] In June 2007, as Miami-Dade County assessed the costs for the state-mandated change to PBOS, a commissioner who formerly supported DRES said that the county will save $800,000 to $2 million in labor costs on major general elections with the paper ballot scanner system. Another commissioner there said, "The longer we keep touch-screen, because of the higher operating costs, is just throwing good money after bad."[35]

B. Expert Findings about the Operational Advantages of the Paper Ballot Scanner System

New Yorkers for Verified Voting is troubled by the Report's claim that nothing in conversations with election officials "suggests that cost advantages of one system might be offset by the operational advantages of the other." We believe that we have strongly indicated in this comment and elsewhere[36] that the paper ballot scanner system is more cost-effective both in operating costs and for acquisition of hardware and software. Nevertheless, even if this were not the case, the fact that experts in computer technology repeatedly have testified that the most reliable currently available modern voting system is the paper ballot scanner system,[37] means that it has operational advantages and we should choose it even if it were not the more economical alternative.[38]

The primary values to be considered in evaluating a voting system are reliability, accuracy, verifiability, security, accessibility, transparency, and auditability. Any feature of a voting system that guarantees these values is an "operational advantage." Any feature that thwarts these values is an "operational disadvantage." In a democracy, people need to be able to understand and observe the electoral process as well as to have reasonable assurances that their votes will be secret, recorded and counted accurately, and kept secure in case there are re-counts.

During recent years numerous governmental and scientific studies have concluded that a software-dependent[39] voting system cannot guarantee these values.[40] Software independence,

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[34] Mary Beth Lane, "Voting Machine Support Costly" http://www.columbusdispatch.com/?story=dispatch/2006/03/05/20060305-C1-00.html.

[35] Matthew I. Pinzur, "Paper-trail vote machines closer in Dade," *The Miami Herald*, June 13, 2007, page 5B, (mpinzur@MiamiHerald.com).

[36] NYVV has published cost comparisons several times during recent years. While the vendors' prices have changed, much of the argumentation is still relevant. See, e.g., "Cost Comparison of Voting Equipment for New York State: Touch Screen DRE with VVPB Printer vs. Paper Based Optical Scan and Ballot Marking Device," http://www.nyvv.org/doc/CostComparisons.pdf.

[37] e.g., Testimony David L. Dill, Professor of Computer Science, Stanford University and Founder of the Verified Voting Foundation and VerifiedVoting.org before the Senate Committee on Rules and Administration, June 21, 2005, Hearing on Voter Verification in the Federal Election Process. Also Avi Rubin, "My Congressional Testimony," 3/7/07 http://votetrustusa.org/index.php?option=com_content&task=view&id=2312&Itemid=26
 And for close attention to the problems with machine testing see Written Testimony of David Wagner, Ph.D., before the Committee on Oversight and Government Reform, Subcommittee on Information Policy, Census, and National Archives, U.S. House of Representatives, May 7, 2007.
http://votetrustusa.org/index.php?option=com_content&task=view&id=2435&Itemid=26

[38] See, e.g., "Advantages of Paper Ballot and Optical Scan (PBOS) Systems," http://www.nyvv.org/doc/OptScanAdvantages.pdf.

[39] On the meaning of software independence see the National Institute of Standards and Technology, "NIST's Role in VVSG & Testing," Congressional testimony of Mark Skall. http://www.vote.nist.gov

[40] See, e.g., The Brennan Center for Justice reports on Voting Technology at http://www.brennancenter.org

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therefore, is an "operational advantage." Leading computer scientists have gone on to point out that the Voter Verifiable Paper Audit Trail (required on DREs in New York) does not solve the problems of DREs, since it is software dependent.[41]

The voter-marked paper ballots upon which the paper ballot scanner system is based are software-independent and can be counted in required audits and recounts. This certainly is an "operational advantage" of the PBOS system over DREs.[42] To counteract common objections, we should note that effective modern technologies combined with careful procedures can keep paper records secure.[43]

Computer and technology experts not only acknowledge that the paper ballot scanner system provides the most verifiable modern system available; they also point out that it provides the other primary values needed for a democracy, including accessibility for persons with special needs.[44] In addition, there is evidence that the PBOS system supports electoral justice for minorities in America.[45]

We urge that Onondaga County grant priority to election integrity in making its decision about a voting system. We recommend that it grant authority to experts in computers and technology in judging the alternatives. Some states now face the consequence of having rushed their decision to choose a voting system as soon as HAVA funds became available. Jurisdictions that opted for paperless DREs now are being asked to replace them with a more reliable voting system in order to meet more recent federal or state requirements as well as to encourage voter confidence.[46]

New York's counties still have the opportunity to choose the time-tested paper ballot scanner system. The full-face DREs that are being marketed in New York are risky, both economically and in terms of election integrity. Not only do they risk votes in invisible software, they are new and untested in actual elections. On the other hand, paper ballot scanner systems have been used in elections in the USA for more than twenty years without major problems. With effective education and proper procedures, voters will be able to trust the paper ballot scanner system. Election workers will be able to understand and manage the new equipment. Choice of the paper ballot scanner system will increase voter confidence as well as save tax dollars.

Notice especially "The Machinery of Democracy: Voting System Usability" and
http://www.brennancenter.org/press_detail.asp?key=100&subkey=39176&init_key=105
http://www.brennancenter.org/dynamic/subpages/download_file_38889.pdf.

[41] See Avi Rubin article cited above, "My Congressional Testimony," 3/7/07
http://votetrustusa.org/index.php?option=com_content&task=view&id=2312&Itemid=26. Also see "Does the 'Voter Verified Paper Audit Trail' Resolve Worries About DREs " http://www.nyvv.org/reports/VVPAT-PB.pdf.

[42] Wanda Warren Berry and Bo Lipari, "Scanner and DRE Voting Machine Problems Are Not Equal,"
http://www.nyvv.org/doc/NotEqual.pdf

[43] Teresa Hommel, "Election Fraud in America: Don't Worry About Paper Ballots—The Problem is Secret Procedures and Lack of Observers,"
http://www.wheresthepaper.org/ElectionFraud_DontWorryAboutPaperBallots.htm.

[44] Noel H. Runyan, "Improving Access to Voting: A Report on the Technology for Accessible Voting Systems,"
linked at http://votetrustusa.org/index.php?option=com_content&task=view&id=2262&Itemid=26. Also see Bo Lipari and Wanda Warren Berry, "Accessible Voting and Paper Ballot/Ballot Marker/Optical Scanner Voting Systems," http://www.nyvv.org/reports/AccessibilityPB.pdf.

[45] The Brennan Center for Justice study of usability found an excessively high undervote rate for minorities using the full-face DREs, see footnote #34 above. Also see "Why Minorities Benefit from Paper Ballots/Optical Scan," http://www.wheresthepaper.org/MaterialsList_WhyMinoritiesNeedPBOS.htm.

[46] E.g., in FL: Palm Beach County, Hector Florin, "PBC approves funding for optical-scan voting," *Palm Beach Post,* 07/11/2007, http://www.palmbeachpost.com/politics/content/local_news/epaper/2007/07/11/0711scan.html; Sarasota County, Stacey Eidson, "New voting machines cost Sarasota $2.9M.", 7/11/2007, http://www.bradenton.com/local/story/95003.html .