UNITED STATES DISTRICT COURT SOUTHERN DISTRICT OF NEW YORK

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CONSERVATIVE PARTY OF NEW YORK STATE and WORKING FAMILIES PARTY,

10 Civ. 6923 (JSR)

Plaintiffs,

-against-

NEW YORK STATE BOARD OF ELECTIONS; JAMES A. WALSH, DOUGLAS A. KELLNER, EVELYN J. AQUILA, and GREGORY P. PETERSON, in their official capacities as Commissioners of the New York State Board of Elections; TODD D. VALENTINE and ROBERT A. BREHM, in their official capacities as Co-Executive Directors of the New York State Board of Elections DECLARATION OF DANIEL WALLACH IN SUPPORT OF PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION

Defendants.

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Daniel Wallach declares as follows:

1. I have been retained as an expert by the plaintiffs in this case to examine the

potential of New York's voting systems to provide voters who "double vote" with notice

and the opportunity to correct their ballots. I submit this report for the Court's

consideration of Plaintiffs' motion for a preliminary injunction.

Professional Experience

2. I am an associate professor in the systems group at Rice University's Department of Computer Science, where I manage Rice's computer security lab. I am also the Director of ACCURATE (A Center for Correct Usable Reliable Accurate and Transparent Elections, supported by the National Science Foundation).

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3. As a computer security expert, I have examined and written about several types of voting systems marketed or used in the United States today, including the Diebold AccuVote-TS, the Hart InterCivic eSlate and the ES&S iVotronic. I am the co-author of a landmark public study of serious security flaws in the Diebold AccuVote-TS electronic voting system.¹ In 2007, I was part of California Secretary of State Debra Bowen's "Top to Bottom Review" where I co-authored the software analysis of the Hart InterCivic eSlate system.²

4. In my capacity as a voting systems expert, I have given invited testimony at a variety of state and federal hearings including before the U.S. Senate Committee on Rules and Administration, Hearing on Electronic Election Reform (February 2007). In the past five years, I have spoken at 77 different engagements, ranging from invited talks and panels before academic, political, and advocacy audiences, as well as invited testimony and hearings, both domestically and abroad. A complete list can be found on my curriculum vitae, annexed hereto as Exhibit A.

5. While my core expertise is in the area of computer security, my engagements, both as a technical expert and as an invited speaker, have exposed me to a variety of different election policies, procedures, and administrations. I have also co-taught a general undergraduate course at Rice University on elections. In this course, we designed a general curriculum that covers how American and international elections work from the perspective of the technology and of the voter.

¹ Tadayoshi Kohno, Adam Stubblefield, Aviel D. Rubin, Dan S. Wallach, *Analysis of an Electronic Voting System*, 2004 IEEE Symposium on Security and Privacy (Oakland, California), May 2004. http://avirubin.com/vote/analysis/

² Srinivas Inguva, Eric Rescorla, Hovav Shacham, and Dan S. Wallach, *Source Code Review of the Hart InterCivic Voting System*, California Secretary of State's "Top to Bottom" Review, July 2007. http://www.sos.ca.gov/elections/voting_systems/ttbr/Hart-source-public.pdf

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6. I have previously served as a technical expert witness on matters related to voting systems, including for Christine Jennings in *Jennings et al. v. Buchanan et al.* at the Florida First District Court of Appeals, which concerned Sarasota, Florida's unusually high undervote rate observed in the 13th Congressional District race in November 2006. In that case, and others, I examined evidence from the elections in question, developed expert opinions, and testified in court. I also served as a technical expert witness for a group of voters in Colorado in 2006 in the case of *Conroy v. Dennis* in Denver District Court where the certification of certain DRE voting systems by Colorado's Secretary of State was challenged.

7. At Rice University, I led a team that designed an electronic voting system prototype called VoteBox.³ I am also one of the founders and organizers of the USENIX/ACCURATE Electronic Voting Technology (EVT) Workshop, now the premier annual venue for scholarship on voting technologies. We bring together software security, cryptography, human factors, political science, policy and public administration experts into a multidisciplinary workshop that has grown in popularity every year.

Resetting New York's Machines for Double Votes

8. A "double vote" occurs when a voter casts her vote for a single candidate on more than one party line in the same contest. An "overvote" occurs when a voter casts her vote for more *candidates* than she is entitled to vote for (i.e., selecting two candidates when she is only entitled to vote for one).

9. Plaintiffs have requested that in the event of a double vote, defendants should be

³ A variety of academic publications are available that describe VoteBox and the code itself is available on an open-source basis. Please see http://votebox.cs.rice.edu

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required to ensure that the voting machines inform voters when a double-vote is detected, that voters should be notified about the consequence of voting for a candidate on more than one party line, and that voters should be provided with the opportunity to correct their ballots.

10. I have not examined either the ES&S DS200 or the Dominion ImageCast, the voting systems that will be used in New York State this November. I have, however, reviewed demonstration videos for both systems on the New York State Board of Elections at http://www.vote-ny.com/english/machine-ds200.php and http://www.vote-ny.com/english/machine-sequoia.php. I have also reviewed statements made by representatives of ES&S to both the New York State Board of Elections and the New York Law Journal, detailing how the DS200 can be programmed to deal with overvoted ballots. Those statements are, in relevant part, annexed to this declaration as Exhibit A.

11. Based upon my review of the videos and ES&S statements, it is my understanding that, in the event that either machine reads a ballot as overvoted, it will display a message titled "Over Voted Ballot" on its notification screen.

12. Based upon my knowledge of computer and voting systems, I believe setting the voting systems to display the same "Over Voted Ballot" message for double votes would be a trivial change to the configuration files and would not require any change to the voting system software. Because no software would need to be modified, testing of the change can be expected to be simple, straightforward and efficient and take very little time.

13. Based upon my knowledge of elections and voting systems generally, as well as the statements from ES&S annexed as Exhibit A, setting both voting systems to

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automatically reject both overvoted and double voted ballots, and thereby provide poll workers with the opportunity to explain the consequences of casting an overvoted or double voted ballot, and providing voters with a new ballot, should be a trivial change to the configuration files and should not require any change to the voting system software. Because no software should need to be modified, testing of the change can be expected to be simple, straightforward and efficient and take very little time.

I swear under penalty of perjury that the foregoing is true and correct.

Dated: Houston, Texas September 29, 2010

DANIEL WALLACH

EXHIBIT A

TGDC Statement of Interest and Qualifications

Dan S. Wallach, Rice University, Department of Computer Science

Cover-page material

Name	Dan S. Wallach
Address	2210 Sheridan St., Houston, TX 77030
Email	dwallach@cs.rice.edu
Phone	713-348-6155
Profession	Professor
Employer	Rice University

1 Areas of Expertise

U.S. Elections, Computer Security, Voting Systems and/or Voting Equipment, Information Technology, Software Testing

2 Descriptions of Expertise

2.1 U.S. Elections

I have broad experience with elections, testifying before local, state, and federal bodies on security issues as well as serving as a technical expert witness on a number of election related lawsuits. I have also conducted research, both building systems in the lab and surveying voters in the field.

I am the Associate Director of ACCURATE (A Center for Correct Usable Reliable Accurate and Transparent Elections, supported by the National Science Foundation).¹ As a computer security expert, I have spoken and interacted with election officials around the country, including giving testimony at a variety of state and federal hearings including being invited to testify before the U.S. Senate Committee on Rules and Administration, Hearing on Electronic Election Reform² (February 2007). In the past five years, I have spoken at 77 different engagements, ranging from invited talks and panels before academic, political, and advocacy audiences, as well as invited testimony and hearings, both domestically and abroad. A complete list can be found on my curriculum vitae.³

While my core expertise is in the area of computer security, my engagements, both as a technical expert and as an invited speaker, have exposed me to a variety of different policies, procedures, and hotly debated topics. I have also taught a general undergraduate course on elections ("Election Systems, Technologies, and Administration," co-taught with Bob Stein, a political scientist, and Mike Byrne, a psychologist and fellow member of ACCURATE). In this course, we designed a general curriculum that covers how American and international elections work from the perspective of the technology and of the voter. We also organized our students to perform exit polling in the November 2006 and November 2008 general elections. In the latter election, we polled during each day of early voting, identifying a significant correlation between the Obama/McCain vote ratio and the Dow Jones Industrial Average. Our data showed that voters voted with their wallets.⁴

¹http://accurate-voting.org

²Written testimony: http://accurate-voting.org/wp-content/uploads/2007/04/dwallach-senate-testimony-7feb07.pdf ³http://www.cs.rice.edu/~dwallach/resume.html

⁴See Robert M. Stein, *Early Voting in 2008: An Examination of Old and New Questions*, Prepared for *Voting in American-The Road Ahead*. Making Voting Work, A project of the Pew Center on the States in collaboration with JEHT Foundation, at Knight Conference Center at the Newseum, Washington, D.C., December 2008.

My experience as a technical expert witness has been very enlightening as to how elections actually operate. Most notably, I served as a technical expert witness for Christine Jennings in *Jennings et al. v. Buchanan et al.*, which concerned Sarasota, Florida's unusually high undervote rate observed in the 13th Congressional District race in November 2006. In that case, and others, I examined electronic and physical evidence from the elections in question, developed expert opinions, and testified in court. In Sarasota, the DRE systems failed to record voter intent in the Congressional race for approximately 15% of the voting population. We still have insufficient evidence to conclusive determine whether the cause was "banner blindness," some other human factors effect, or whether there were relevant hardware or software bugs. I've written more on the Sarasota issue in a technical report,⁵ and a blog piece.⁶ In another contested election in Webb County, Texas, I found evidence of test votes ("logic and accuracy testing") included in the final election tally, as well as machines that were cleared mid-day while the election was ongoing (and thus forever losing whatever votes were contained within).

Finally, I have extensive experience dealing with the press on electronic voting issues as they have arisen in real election. For example, many DRE voting systems are commonly accused of "flipping" their votes. In fact, these behaviors appear to be the result of some counter-intuitive behaviors in their user interface. To better explain these issues, as they occurred last year with Hart InterCivic's eSlate system, I wrote a detailed and widely read blog entry on the topic.⁷

2.2 Voting Processes and Activities

My experiences with contested elections have led directly to many of my research activities. For example, our team at Rice University designed an electronic voting system prototype called Vote-Box.⁸ One of the explicit design goals of VoteBox was to provide better post-election audit logs to better enable forensic understanding of what went on in the election. If test votes were accidentally included, this would be easy to detect and remedy. Likewise, if a machine were cleared in the middle of an election, verifiable copies of its votes would be recorded on other voting machines in the same polling place.⁹ If votes were deliberately deleted or tampered, this fact would be easy to verify. VoteBox also makes extensive use of modern cryptographic security techniques that I will describe in "Cryptographic Protocols," below.

Another essential activity has been my work on finding flaws in existing voting systems. I was a co-author of a landmark public study of serious security flaws in the Diebold AccuVote-TS electronic voting system.¹⁰ In 2007, I was part of California Secretary of State Debra Bowen's "Top to Bottom Review" where I co-authored the software analysis of the Hart InterCivic eSlate

⁵David L. Dill and Dan S. Wallach, *Stones Unturned: Gaps in the Investigation of Sarasota's Disputed Congressional Election*, April 2007. http://www.cs.rice.edu/~dwallach/pub/sarasota07.html

⁶Dan S. Wallach, *The Continuing Saga of Sarasota's Lost Votes*, Freedom To Tinker Blog, February 2008. http://www.freedom-to-tinker.com/blog/dwallach/continuing-saga-sarasotas-lost-votes

⁷Dan S. Wallach, *Vote "Flipping" on Hart InterCivic eSlate Systems*, ACCURATE Voting Blog, October 2008. http://accurate-voting.org/2008/10/22/vote-flipping-on-hart-intercivic-eslate-systems/

⁸A variety of academic publications are available that describe VoteBox and the code itself is available on an open-source basis. Please see http://votebox.cs.rice.edu

⁹We found both of these issues in the March 2006 primary election in Webb County, Texas. Further detail can be found in Daniel Sandler and Dan S. Wallach. *Casting Votes in the Auditorium*. In Proceedings of the 2nd USENIX/ACCURATE Electronic Voting Technology Workshop (EVT'07), 2007. http://accurate-voting.org/wp-content/uploads/2007/08/evt07-sandler.pdf

¹⁰Tadayoshi Kohno, Adam Stubblefield, Aviel D. Rubin, Dan S. Wallach, *Analysis of an Electronic Voting System*, 2004 IEEE Symposium on Security and Privacy (Oakland, California), May 2004. http://avirubin.com/vote/analysis/

system.¹¹ These studies, and comparable studies by other authors, have completely changed our understanding of how voting machines can and should be engineered.

Furthermore, I have been involved in ACCURATE's responses to EAC calls for comments on the VVSG standards.¹² All of the ACCURATE researchers feel that the security standards promulgated by the EAC can and should be stronger than they presently are. I also have a position paper on upcoming "end to end" cryptographic standards to appear at a NIST workshop in October on the topic and I have testified before the TGDC in 2004, among other government bodies. I also blog regularly on election-related topics.¹³

Finally, I was one of the founders and organizers of the USENIX/ACCURATE Electronic Voting Technology (EVT) Workshop, now the premier annual venue for scholarship on voting technologies. We bring together software security, cryptography, human factors, political science, policy and public administration experts into a multidisciplinary workshop that has grown in popularity every year.

2.3 Voting Systems Design and Equipment

As described above, I have been involved with two critical "red team" style analyses of electronic voting equipment. An essential finding of our work, and in other studies of electronic voting systems, is that the previous NASED certification standards and ITA processes were unable to prevent significant security flaws from finding their way into fielded commercial voting products.

Toward that end, my academic efforts and the efforts of my fellow ACCURATE researchers have focused on how we might design better voting systems. The VoteBox project, for example, showed how one could integrate a variety of cryptographic techniques into a single voting machine to improve vote integrity, verifying that ballots are cast as intended and counted as cast. It showed how to improve availability of ballots, even in the face of systematic tampering. We accomplished all of these design goals while using an order of magnitude less code than commercial voting systems, making verification of correctness a much lighter burden. By doing this work and making both our written papers and our source code freely available under open licenses, we are working to reduce the risk to the voting systems vendors for adopting more sophisticated technologies. They are free to use our code, without payment, toward improving the security of their own systems.

2.4 Testing and Certification Procedures and Policies

Our 2004 study of the Diebold AccuVote-TS generated a fair amount of controversy about how testing and certification should be conducted and how the results of those tests should be disseminated. Should security analyses be kept private, or should they be publicized? Must there be independent third-party confirmation? To what extent must security analyses be "realistic" in considering how human policies and procedures interact with technological limitations in voting systems' designs? Can tamper-evident seals and other such technologies compensate for or mitigate against software security vulnerabilities? At the time, none of these questions had been carefully considered.

I have been involved in a variety of "red team" exercises for private clients, outside of the vot-

¹¹Srinivas Inguva, Eric Rescorla, Hovav Shacham, and Dan S. Wallach, *Source Code Review of the Hart InterCivic Voting System*, California Secretary of State's "Top to Bottom" Review, July 2007. http://www.sos.ca.gov/elections/voting_systems/ttbr/Hart-source-public.pdf

¹²Available at http://accurate-voting.org

¹³ http://www.freedom-to-tinker.com/blog/dwallach

ing world. These exercises always follow the same script. We ask detailed questions of the client, then we analyze their code and write a detailed report. Clients then use these reports to improve their systems. I have also been involved in other public analyses of security systems whose failure would have a significant public impact, including my original academic work on the security of Netscape's web browsers¹⁴ as well as a study we did of the Recording Industry Association of America's "Secure Digital Music Initiative," meant to limit its customers' ability to copy music.¹⁵ While no company likes having its flaws exposed in public, these companies are not the sole stakeholders in their products. Good products can and do survive public analysis and debate. We should expect no less of our voting systems. The California "Top to Bottom" Reports, the Ohio "EVER-EST" Reports, and the Florida "SAIT" Reports provide an important road-map to how electronic voting systems can and should be evaluated and certified for use.

While those studies proved invaluable in gaining an understanding of how voting systems are weak and need to be improved, vendors have publicly expressed that they don't have sufficient guidance as to how they might implement sufficiently strong systems. This issue underscores a fundamental limitation in how voting systems are presently regulated. Rather than the current regulatory model where vendors first develop products and then submit them for certification, a perfectly reasonable and likely preferable alternative would be for the EAC to be more engaged in the development process of voting system vendors as a precondition to certifying their systems. I've written a good deal more about how this could work.¹⁶ The TGDC would be an excellent vehicle through which to create a more interactive certification process.

2.5 Information Technology—Hardware or Software Systems

No additional material to add here.

2.6 Requirements Based Testing

No additional material to add here.

2.7 Cryptographic Protocols

While I do not consider myself a cryptographer, I understand the cryptographic mechanisms, requirements, and challenges for electronic voting systems, and I believe that improved standards can enable these techniques to migrate out of the lab and into the field.

Within our VoteBox research at Rice University, we have build Elgamal homomorphic encryption, with Chaum-Pedersen non-interactive zero-knowledge proofs and Benaloh-style voting system challenges, into the basic design of our system. We also leveraged "gossip" protocols along with hash chain entanglements to spread information around a precinct of voting machines and safely to the Internet, providing strong resistance to a variety of threats. We also designed a variant on our VoteBox system that would safely enable votes to be cast over the Internet.¹⁷ In

¹⁴Drew Dean, Edward W. Felten, and Dan S. Wallach, *Java Security: From HotJava to Netscape and Beyond*, 1996 IEEE Symposium on Security and Privacy (Oakland, California), May 1996, pp. 190-200. http://www.cs.princeton.edu/sip/pub/secure96.html

¹⁵Scott A. Craver, Min Wu, Bede Liu, Adam Stubblefield, Ben Swartzlander, Dan S. Wallach, Drew Dean, and Edward W. Felten, *Reading Between the Lines: Lessons from the SDMI Challenge*, 10th Usenix Security Symposium (Washington, D.C.), August 2001. http://www.usenix.org/events/sec01/craver.pdf

¹⁶Dan S. Wallach, *Rethinking the Voting System Certification Process*, Freedom to Tinker Blog, February 2009. http://www.freedom-to-tinker.com/blog/dwallach/rethinking-voting-system-certification-process

¹⁷Daniel R. Sandler and Dan S. Wallach, The Case for Networked Remote Voting Precincts. 3rd

selecting these mechanisms, we learned how many other cryptographic mechanisms operate and ultimately consulted with cryptographers on the proper way to implement the mechanisms we chose for ourselves.

Beyond voting-related cryptographic mechanisms, I also have experience with general-purpose cryptographic protocols, most notably co-authoring a study on performance issues and bottlenecks with SSL/TLS encryption, particularly as used by secure web servers.¹⁸ While most prior work had assumed that public key cryptographic computations were so expensive as to be the fundamental limit of computational performance, we found that all the other operations required by cryptographic protocols add up, and that as computers get faster, these other operations will become the dominant performance limitations.

2.8 Audit Processes and Methods

One of the strongest benefits of electronic voting systems is that they can (potentially) generate very detailed logs from which we can reconstruct what happened during an election. One of the greatest failings of electronic voting systems in the real world is that these logs are often damaged, incomplete, or inconsistent. Most of my experience with election audits has been analyzing electronic voting system logs to identify such anomalies and designing technologies to improve these systems.^{19,20}

2.9 Internet Technologies Related to Security, Usability, and Communication Protocols

In addition to the work I've already described, I have done a fair amount of research in these areas outside of the context of voting. For example, I coauthored one of the original papers to consider whether web browsers could be "spoofed" into presenting users with the proper user interface for a secure connection, while the users was actually under attack.²¹ I also have a significant amount of experience in the design and engineering of security for peer-to-peer network protocols, reasoning about how they might be attacked and defended.^{22,23}

As such, when we discuss the possibility of voting over the Internet, we must consider how it could be done safely. Using appropriate cryptographic mechanisms, we could certainly set up remote voting precincts that ship finished votes over the Internet to their appropriate home election

USENIX/ACCURATE Electronic Voting Technology Workshop (EVT '08) (San Jose, California), August 2008. http://www.cs.rice.edu/~dsandler/pub/sandler08remotebox.pdf

¹⁸Cristian Coarfa, Peter Druschel, Dan S. Wallach, *Performance Analysis of TLS Web Servers*, ACM Transactions on Computer Systems, vol. 24, no. 1, February 2006. http://www.cs.rice.edu/~dwallach/pub/tls-tocs.pdf

¹⁹Daniel R. Sandler, Kyle Derr, Scott Crosby, and Dan S. Wallach. *Finding the evidence in tamper-evident logs*. Proceedings of the 3rd International Workshop on Systematic Approaches to Digital Forensic Engineering (SADFE '08) (Oakland, California), May 2008. http://www.cs.rice.edu/~dsandler/pub/sandler08evidence.pdf

²⁰Daniel Sandler and Dan S. Wallach, *Casting Votes in the Auditorium*, 2nd USENIX/ACCURATE Electronic Voting Technology Workshop (EVT '07) (Boston, Massachusetts), August 2007. http://accurate-voting.org/wp-content/uploads/2007/08/evt07-sandler.pdf

²¹Edward W. Felten, Dirk Balfanz, Drew Dean, and Dan S. Wallach, *Web Spoofing: An Internet Con Game*, 20th National Information Systems Security Conference (Baltimore, Maryland), October 1996. http://www.cs.princeton.edu/sip/pub/spoofing.html

²²Atul Singh, Tsuen-Wan "Johnny" Ngan, Peter Druschel, and Dan S. Wallach, *Eclipse Attacks on Overlay Networks: Threats and Defenses*, IEEE INFOCOM '06 (Barcelona, Spain), April 2006. http://www.cs.rice.edu/~dwallach/pub/eclipse-infocom06.pdf

²³Miguel Castro, Peter Druschel, Ayalvadi Ganesh, Antony Rowstron and Dan S. Wallach, *Security for Peer-to-Peer Routing Overlays*. Fifth Symposium on Operating Systems Design and Implementation (OSDI '02) (Boston, Massachusetts), December 2002. http://www.cs.rice.edu/~dwallach/pub/osdi2002.html

authority.²⁴ Allowing Internet voting from a home computer, however, is problematic. We must be concerned that the computer may be compromised by viruses, worms, or other such malware that could be engineered specifically to target a user when they cast a vote. We must also be concerned about the voter's privacy relative to traditional attacks that might coerce or bribe the voter to casting a vote in a particular way. I've written more about these topics in several blog posts.^{25,26}

2.10 Analyzing and Evaluating Human Behavior in Relation to Computer Technology

In collaboration with my ACCURATE colleague Mike Byrne, I have been engaged in a variety of human factors experiments at Rice concerning electronic voting. One of the features in VoteBox is that it has a built-in mode that makes it collect data suitable for this sort of experimentation. We have used it to understand the relative usability of DRE versus traditional paper and lever machines.²⁷ Most interestingly, we modified VoteBox to lie to our test subjects on the summary screen, allowing us to determine voters' ability to detect such errors (deliberate or otherwise). Our initial work found that roughly two thirds of our test subjects were unable to detect these errors.²⁸ After extensive improvements to the human factors of VoteBox, including highlighting undervotes in a bright orange color, we improved this error rate to roughly half of our test population.²⁹

Clearly, we still have a way to go in improving the usability of voting systems for the general voting population, and extending this degree of usability to voters with low or zero vision, low motor control, and a variety of other needs present important research challenges.

3 Organizations

I have consulted to a number of organizations related to voting issues, including the Verified Voting Foundation, the Election Science Institute (VoteWatch), and the National Committee for Vote Integrity. Verified Voting is still active in an advocacy role, and I answer their questions as best I can, and I sometimes endorse their positions. The Election Science Institute and the National Committee for Vote Integrity appear to no longer be active. I have also consulted to the Democratic National Committee, primarily answering questions they had concerning election security. I have also consulted to local Republicans within Texas. I note that I am not a registered member of any political party.

If I were offered membership in the TGDC, I would refrain from taking consulting roles with the political parties and would similarly refrain from taking expert witness positions on behalf of

²⁴Daniel R. Sandler and Dan S. Wallach, The Case for Networked Remote Voting Precincts. 3rd USENIX/ACCURATE Electronic Voting Technology Workshop (EVT '08) (San Jose, California), August 2008. http://www.cs.rice.edu/~dsandler/pub/sandler08remotebox.pdf

²⁵Dan S. Wallach, *Internet Voting (Or, How I Learned to Stop Worrying and Love Having the Whole World Know Exactly How I Voted)*, February 2008. http://www.freedom-to-tinker.com/blog/dwallach/internet-voting

²⁶Dan S. Wallach, *Internet Voting-a-Go-Go*, December 2008. http://www.freedom-to-tinker.com/blog/dwallach/ internet-voting-go-go

²⁷Sarah P. Everett, Kristen K. Greene, Michael D. Byrne, Dan S. Wallach, Kyle Derr, Daniel Sandler, and Ted Torous, ElectronicVotingMachinesversusTraditionalMethods:ImprovedPreference,SimilarPerformance, Human Factors in Computing Systems: Proceedings of CHI 2008 (Florence, Italy), April 2008. http: //chil.rice.edu/research/pdf/EverettGreeneBWDST_08.pdf

²⁸Sarah P. Everett. *The Usability of Electronic Voting Machines and How Votes Can Be Changed Without Detection*. Doctoral disseration, Rice University, Houston, TX, 2007. http://chil.rice.edu/research/pdf/EverettDissertation.pdf

²⁹Bryan A. Campbell and Michael D. Byrne. *Now do voters notice review screen anomalies? A look at voting system usability*. In Proceedings of the 2009 Electronic Voting Technology Workshop / Workshop on Trustworthy Elections (EVT/WOTE '09). http://www.usenix.org/events/evtwote09/tech/full_papers/campbell.pdf

politicians in contested elections.

4 Education, Work Experience, Publications, etc.

I earned my bachelors of science in electrical engineering and computer science at the University of California at Berkeley in 1993. I earned my masters and doctorate degree in computer science at Princeton University in 1995 and 1999, respectively. Since then, I have been employed as an assistant and now associate professor in Rice's department of computer science. During my undergraduate and graduate studies, I spent most summers doing internships in the computer industry, most notably spending two summers at Netscape Communications Corporation (1996 and 1997), working on security issues in the Java aspects of their web browser. As a faculty member, I have served in a variety of industrial consulting arrangements, doing red-team exercises, design reviews, and legal expert witness work.

I have presently co-authored 69 refereed technical papers in technical workshops, conferences and journals, mostly in the area of computer security. I have cited many of these papers, and included URLs, in the footnotes to this letter. My full curriculum vita is available online³⁰ and contains links to all of my publications, written testimony, consulting and work history, and many other details.

³⁰http://www.cs.rice.edu/~dwallach/resume.html

EXHIBIT B

5.0 Requirements & Requirements Response

5.1 Administrative Requirements

5.1.1 Proposal Submission

The following section must be completed by two members of the Proposer's Executive Team.

- 1) We affirm that the firm's authorized representatives have read and understand all applicable Federal, State, and local election and information technology laws and regulations.
- 2) We affirm that the firm's authorized representatives have read, understood, and agreed to comply with the requirements of New York State Election Law.
- **3)** We affirm that the proposed voting system and functionality provided by the election management system and all voting devices shall comply with all provisions of Federal, State, and local election and information technology laws and regulations, and future modifications to those laws and regulations.

ES&S RESPONSE

ES&S will exercise all commercially reasonable efforts to make any technologically feasible modifications to its proprietary voting devices and election management system software as may be required in order to comply with applicable relevant federal, state and local election laws and regulations, including New York state voting system standards, as may be required in order to certify such voting system for use by the City of New York.

Specifically, during the warranty period and thereafter so long as the City is receiving ES&S Hardware Maintenance Services and ES&S Software Maintenance and Support Services, the equipment and licensed software shall be maintained or upgraded by ES&S in such a way as to remain compliant with all applicable state election laws and regulations, including all current and future requirements necessary to remain certified for use in the State of New York. "Maintained or upgraded" shall mean only such changes to individual items of the licensed software (but not equipment) as are technologically feasible and commercially reasonable. The City shall be responsible for the cost of all replacements, retrofits or modifications to the equipment purchased under this RFI. City shall also be responsible for (i) the cost of any third party items that ES&S notifies City are hereinafter required in order for the equipment and licensed software to remain compliant and certified, and (ii) City's pro-rata share of the costs of any future state certifications or recertifications and any mandated modifications to the equipment and/or licensed software that may result therefrom that are not otherwise required as a result of any changes or modifications voluntarily made by ES&S to the licensed software or equipment licensed and sold hereunder.

- 4) We affirm that our proposed voting system response to this RFI is true and correct
- 5) We affirm that the proposed costs in our response to this RFI will be valid for contract for <u>120</u> days from proposal due date.

Proposal Submission Subcategories	Vendor Response	
Describe actions the firm will take to keep the proposed voting system supplied to the BOE in NYC in compliance with all applicable election laws and regulations.	During the warranty period and thereafter so long as the City has paid for and is receiving ES&S Hardware Maintenance Services and ES&S Software Maintenance and Support Services, the equipment and licensed software shall be maintained or upgraded by	

The Board of Elections in the City of New York December 17, 2008

Proposal Submission Subcategories	Vendor Response	
	ES&S in such a way as to remain compliant with all applicable state election laws and regulations related to accessibility, including all current and future requirements necessary to remain certified for use in the State of New York. "Maintained or upgraded" shall mean only such changes to individual items of the licensed software (but not equipment) as are technologically feasible and commercially reasonable in ES&S' discretion.	
	The City shall be responsible for the cost of all replacements, retrofits or modifications to the ES&S equipment that may be developed and offered by ES&S in order for such ES&S equipment to remain compliant with applicable laws and regulations. City shall also be responsible for (i) the cost of any third party items that ES&S notifies City are hereinafter required in order for the equipment and licensed software to remain compliant and certified, and (ii) City's pro-rata share of the costs of any future state certifications or recertifications and any mandated modifications to the equipment and/or licensed software that may result therefrom that are not otherwise required as a result of any changes or modifications voluntarily made by ES&S to the licensed software or equipment licensed and sold hereunder. City's pro-rata share of such certifications to the equipment and/or licensed software that may result therefrom shall be determined at the time by dividing the number of registered voters in the City's jurisdiction by the total number of registered voters in all New York cities and counties to which ES&S has sold and/or licensed and licensed software purchased and licensed by the City.	

Print Name/Title:

Thomas F. O'Brien, CFO

Signature:

Print Name/Title:

Matthew E. Nelson, Senior Vice President of Sales

Signature:

5.2 Voting System Design Requirements

As shown in the Glossary, BOE in NYC defines "Voting System" as the total combination of mechanical, electro-mechanical, or electronic equipment, and any ancillary equipment and all

EMS Functionality Subcategories	Vendor Response Poll Site Scanner	Vendor Response Ballot Marking Device
		ES&S AutoMARK unit prior to opening the polls. ElectionWare includes support for English, Spanish, Korean, and Chinese (Mandarin and Cantonese) languages in audio and display formats. Additional languages can be added by creating custom bitmaps for the visual prompts (for non- Latin based languages) and custom audio files for the audio prompts.
9) Recorded vs. Synthesized - What are the advantages and disadvantages of using recorded voice versus synthesized voice and what is the impact on the voting process?	The DS200 does not have an audio component.	Both recorded and synthesized speech have been used successfully in voting applications. Many jurisdictions prefer human recorded audio, perceiving that it is more pleasant to hear. The ballot is often recorded in two voices, one for instructions, and one for ballot content. Synthesized speech may be simpler to prepare, although phonics adjustments are usually required. All languages may not be available for synthesized speech.
10) Setting PVS Parameters – Detail the PVS parameters that may be changed through the EMS and the process to do so. (i.e. closing polls, over/under alerts, exception handling & messages, reporting)	 The following parameters may be changed through the EMS for the DS200: Allow reopen polls (yes or no). Number of report tapes to print on close. Number of zero tapes to print on open. Poll or precinct level report. Auto print audit log report on close (yes or no). Media or summary (regular) report format. Query, accept, or reject undervotes. Query, accept, or reject overvotes. 	Most of the characteristics listed here are characteristics usually associated with a tabulation device, not a ballot marking device. The ES&S AutoMARK will alert the voter if a contest is undervoted and will not allow a contest to be overvoted. Default system messages and election- specific messages can be changed by the user. In ElectionWare Configure the user can also change the following settings on the AutoMARK settings screen: • Alert the voter if not all contest choices are displayed on the screen. • Force the voter to view all contest choices.

Ро	Ilworker Activity Subcategories	Vendor Response Poll Site Scanner	Vendor Response Ballot Marking Device
4)	Activate for Voter – Describe the capabilities and procedures that demonstrate the ease with which the proposed Pollsite Voting System can be activated for each voter. What mechanism is used to activate the correct ballot for the voter?	The DS200 automatically activates when a voter inserts a marked paper ballot into the terminal's input slot. Messages on the LCD screen guide the voter through the process, and confirm that the ballot has been tabulated.	The ES&S AutoMARK automatically activates when a voter inserts a blank paper ballot into the terminal's input slot. A series of on screen and audio prompts guide the voter through ballot navigation and selections. After the voter completes ballot selections, the system summarizes selections and marks the voter's ballot.
5)	<i>Voter with Disability Readiness</i> – Describe the capabilities of the proposed Pollsite Voting System that make it easy to place the machine into, and return back from, disability readiness for voter with special needs.	The ES&S AutoMARK ballot marking device is designed to mark the ballot for voters with disabilities. After the disabled voter's ballot is marked, the ballot is privately and independently transported by the voter to the DS200 for tabulation.	The ES&S AutoMARK has only one system configuration. When placed on an optional ES&S AutoMARK voting table or within the NYC transport cart, the system meets all HAVA and disability requirements for reach and accessibility.
6)	Visual & Audio Indications – Describe the capabilities of the proposed Pollsite Voting System that provide clear visual/audibly indication that the current ballot has been cast and the equipment is ready for the next voter.	When a voter inserts a ballot into the DS200, the terminal scans the entire ballot (front and back), interprets voter selections and accepts the ballot, adding votes to the system tally. A confirmation screen provides clear feedback to the voter that their ballot has been successfully tabulated.	After the ES&S AutoMARK marks a ballot, the system emits an audible tone and displays a message instructing the voter to remove the marked ballot from the output slot or allow the AutoCast feature to drop the ballot out the back of the device into a secure container. The ES&S system resets for voting almost instantaneously.
7)	Read Error Messages – Describe the capabilities of the proposed Pollsite Voting System that provide error messages that are clear and understandable by the average inspector.	If there is an exception condition, such as undervotes, overvotes, crossover votes or ballot mismarks, the terminal displays a warning message on the terminal's large text 12-inch LCD display and plays an audible alert. The DS200 then provides step-by-step instructions for resolving any ballot issue. The jurisdiction is responsible for determining the correct procedure for handling blank and/or overvoted ballots. These ballots can be predetermined to be returned to the voter or to be accepted into the unit without an alert message. Ballots returned to the voter can be removed.	The ES&S AutoMARK includes built-in error detection features and provides correction methods. Error messages are displayed on the touch screen monitor when the ES&S AutoMARK detects a critical condition that requires operator intervention to correct the problem before the voting process can be continued. A listing of error messages presented to the poll inspector and voter are found in Appendix D.1 and D.2 .

Pollworker Activity Subcategories	Vendor Response Poll Site Scanner	Vendor Response Ballot Marking Device
	reviewed, replaced with a new ballot and revoted, or the voter may decide to keep the original ballot and condition and not make any changes.	
	This process vastly dramatically reduces the number of invalid ballots cast during your election, ensuring that every ballot cast represents the voter's intent.	
	A listing of error messages presented to the poll inspector and voter are found in Appendix D.1 and D.2.	
8) Election Day Error Solutions – Describe the capabilities of the proposed Pollsite Voting System that provide simple solutions for correcting Election Day errors. Distinguish between those correctable by Pollworkers and those that would require a Voting Machine Technician.	The DS200 is capable of displaying images, animation and video. This allows pollworkers to visually see solutions instead of just reading which might not be as clear.	The ES&S AutoMARK generates a full complement of error messages in audio and display format. ES&S' training documentation offers preliminary troubleshooting steps which often resolve errors – including ballot jams, feed errors, memory card insertion errors, and so on. Functionality errors requiring the assistance of a technician are indicated by messages as well.
	For example, a potential error message could be "Memory device not found". The "Show Me" button provides a picture of the memory device being inserted into the proper location.	
	Pollworkers can correct task- related errors. A voting machine technician should be called when an issue moves from task-related to component failure.	
9) Close Polls – Describe the capabilities of the proposed Pollsite Voting System that provide easy to close (both physically and electronically) while still maintaining security. What device, if any is used in	Once the polls are closed and voting has ended, the pollworker unlocks the access door, then presses and holds the CLOSE POLLS button for approximately 5 seconds.	Once the polls are closed, poll workers simply turn off the control key, unplug the unit. and close and seal the doors of the transport cart
the process?	Once the CLOSE POLLS button is released, the DS200 will close the polls and automatically print a Voting Results Report and any other reports set up to automatically print, such as an Audit Log Report.	
10) Reporting – Describe the capabilities of the proposed Pollsite Voting System that provide clear, readable reports for the Poll Worker.	The DS200 generates a variety of results reports after the polls close. Depending on the options configured for your election definition, the scanner may automatically print reports when you close the polls. Or you can manually select reports from the POLLS CLOSED screen.	The ES&S AutoMARK does not tabulate results and is not configured to print automatic reports. Election officials can print the system event log and scan log from the unit's administration menus. All reports are printed in full

Voting Process Subcategories		Vendor Response Poll Site Scanner	Vendor Response Ballot Marking Device
		voter selections and either accepts the ballot, adding votes to the system tally; or identifies and alerts the voter to any exception condition (undervotes, overvotes, crossover votes or ballot mismarks) with large, easy-to- read system messages and audible alerts. The DS200 provides instructions for resolving any ballot issue, vastly improving voter oversight and accountability and dramatically reducing the number of invalid ballots cast during your election.	tallied.
2)	Over Voting & Under-voting – Describe how the Pollsite Voting System prevents the voter from over voting and notifies the voter that they are under voting and how the voter can correct his or her ballot. a) Can the under-voting alert be configured to be turned-off?	The DS200 can be programmed to stop and return ballots to voters who have made an error in marking their ballot. It can also be programmed to detect overvotes, undervotes, mismarked ballots and crossover ballots. When an incorrect ballot is fed into the DS200, the unit stops processing and emits an audible signal and displays a message describing the problem. It also activates two buttons: an ACCEPT button and a REJECT button. If the voter chooses to mark a new ballot, he/she or the poll official would press the RETURN BALLOT button, which sends the ballot out to be spoiled. If the voter chooses not to mark a new ballot, the COUNT AS MARKED button is pressed and the ballot is placed in the ballot box. The City of New York will be responsible for determining the correct procedure for handling blank and/or undervoted ballots. These ballots can be predetermined to be returned to the voter or to be accepted into the unit without an alert message. Ballots returned to the voter can be removed, reviewed, replaced with a new ballot and revoted, or the voter may decide to keep the original ballot and condition and not make any changes.	The ES&S AutoMARK guards voters from selecting more than the allowed number of candidates or ballot options for a contest. System messages identify any contests where a voter marks fewer than the allowed number of selections.
3)	Independency - Describe how the	The DS200 allows for ballots to be	The ES&S AutoMARK

Vo	ting Process Subcategories	Vendor Response Poll Site Scanner	Vendor Response Ballot Marking Device
	Pollsite Voting System will allow voters with disabilities to completely cast their ballot independently and in privacy.	deposited utilizing a secrecy sleeve which completely covers the ballot for ultimate privacy.	records selections on the same paper ballot used by every voter at the polling place, ensuring privacy and anonymity during ballot counting.
			Voters who use the ES&S AutoMARK's large LCD display to select their ballot options, do so behind a standard privacy screen to prevent onlookers from viewing the ballot display. If a voter is using an audio ballot, the screen can be blanked to prevent onlookers from seeing the voter's choices.
			Once the voter's ballot is marked by the AutoMARK and returned to the voter, a privacy sleeve can be used by the voter to transport the completed ballot to the DS200 for tabulation at the precinct.
4)	 Voter Verification – Describe how the design of the voter verification feature makes it efficient to use. a) Does the voter review operate in such a manner that the jurisdiction can limit the time or cycles of review in order to ensure voter does not unduly slow the voting process. 	Voters using the DS200 can review all their choices on their paper ballots before inserting it into the DS200 for scanning. In the setup of the DS200 the NYC BOE will have the ability to set the reviewing criteria for the voters. For example, you can force a voter to view their overvote error before being able to cast ballot or you can allow them to cast their ballot right from the error notification screen.	There is software provision in the AutoMARK to limit the time or cycles of review. Since this unit is primarily to support ADA voting, the extended time of a voting session will not slow the mainstream voting process since it does not require its use. The intrinsic time of a voting session, especially if voting by audio, will be longer than voting a paper ballot by hand and the review time will normally not be the primary contributor.
5)	Intuitive – Describe how the proposed Pollsite Voting System would be familiar to NYC voters or easy for them to use.	The ballot is designed to mimic the look and feel of a lever machine ballot, making it very familiar to NYC voters. The ballot can be inserted into the DS200 in any orientation so the voter cannot make an error in that regard. In addition, the screen runs animation to show where the ballot is inserted. Any error messages will be displayed in that voter's language of choice.	The ES&S AutoMARK touch screen follows the same operating principles as an ATM touch screen. Intuitive menus, dynamic selection highlighting and a comprehensive ballot summary provide voters the best possible environment to select desired candidates and ballot options without confusion.

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doing a hand count of 100 percent of the votes cast" to insure that the computerized scanners properly recorded the paper ballots.

The possibility that postelection litigation will result in hand counts of all votes raises "nightmare possibilities," said Martin Connor, who is handling the legal work for Sean Coffey, a class action securities lawyer at Bernstein, Litowitz, Berger & Grossman until leaving to seek the Democratic nomination for attorney general.

"It will all depend on the math, but in a close election where every vote counts, what's an acceptable error rate?" said Mr. Connor, a former state senator.

New York is one of the last states in the nation to abandon the mechanical-lever machines it had used for 50 years. Last year, about 15 percent of the state's voters in 46 upstate counties tested the new electronic machines during a pilot project in both the primary and general election. New York City voters, who are about 38 percent of the total of the state's registered voters, are being introduced to the new devices today.

The machines were required by the Help America Vote Act (HAVA), enacted in 2002, 42 USCA §15301 et seq., in the wake of the stalemate that delayed for weeks the determination of a winner in the 2000 presidential race.

New York state did not enact legislation to implement the federal law until 2005, shortly before the state was sued by the U.S. Justice Department to compel it to comply with HAVA.

Douglas Kellner, co-chairman of the New York State Board of Elections, said the legislation adopted in New York and regulations issued by the state board went "far beyond" the safeguards mandated by HAVA.

For instance, he said, state law requires that local boards audit all votes cast on 3 percent of the machines within their jurisdic-

DECISIONS WANTED!

CRIT ACCOUNTS NOT THE REPORT OF

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uncovered, successive audits can be required of more machines, up to a total recount.

Separately, he added, the New York City Board of Elections requires a total recount in any race where the apparent winner has a victory margin of less than 10 votes or .5 percent of all votes cast. Notogy and programing, according to election officials. Both machines, like those used in the 13 Florida counties, warn a voter that they have voted for too many candidates and present

The election lawyers cited several potential voter mistakes that could cause a ballot not to be counted in violation of the New York law, which states that a vote must be counted as long as the voter's intent is clear.

For instance, the lawyers said, a voter could circle a candidate's name or put an "X" through the entire box containing the name rather than filling in the oval next to the name.

With the law untested, Mr. Connor said, lawyers have no idea how judges will determine the degree to which ballots must be examined by hand. "The \$64 million question," he said, is whether the courts will adopt the standards in New York's law (Chapter 181 of the Laws of 2005) to determine how many paper ballots must be examined. Until case law is developed, Mr. Connor said, election lawyers will be unable to give their clients "a ballpark" figure on how much it will cost to litigate the outcome of an election.

'Overvote' Issue

In June, the Brennan Center for Justice at New York University School of Law brought a lawsuit claiming a constitutional equal protection violation because the way the machines are set up in New York makes it likely that ballots will be voided where voters mistakenly vote for more candidates than permitted.

The Brennan Center's challenge before Eastern District Judge Frederic Block in NAACP New York State Conference v. New York State Board of Elections, CV10-2950, is built around a study of voting patterns in Florida that found that the machines are 14 times more likely to void "overvotes" than similar machines programed differently.

The study conducted by the Florida Fair Elections Center examined votes cast in 13 Florida counties that used the same voting machine—Election Systems and Software's (ESS) 200—being used in New York City and five other counties. ties are using a machine manufactured by Dominion Voting, that is similar to the ESS200 in its technology and programing, according to election officials.

Both machines, like those used in the 13 Florida counties, warn a voter that they have voted for too many candidates and present two options: either press a green button in which case the vote will be "accepted" or a red button to get the ballot back.

By contrast, 38 counties in Florida used scanners that automatically reject a ballot containing more votes than permitted.

The study concluded that voters in the Florida counties using the ESS200 were 14 times more likely to lose votes when they overvoted, said Mary K. Garber, director of research at the Florida Fair Elections Center.

Lawrence R. Nordgren, a Brennan Center attorney handling the challenge, said the Florida study makes it plain that the systems being used in New York will result in "lost votes" that were clearly mistakenly cast.

"Since the mistake can be easily remedied," he said, the state has an obligation to make sure that its voters are not disenfranchised.

Mr. Kellner, the co-chairman of the state elections board, said that although the machines should use clearer language to explain the issue of overvotes, the Brennan Center has blown the issue "way out of proportion."

He noted that the Brennan Center had been working with the board for four years on introducing the new machines in New York. Nonetheless, he said, the center only raised the overvote issue "recently when it was too late to make challenges on this year's ballot."

The state has not yet answered the Brennan Center's suit.

John Groh, a senior vice president at ESS, said the company's machines can be programmed to reject ballots containing overvotes, but whether to do so is a decision that must be made by the state and city boards of election.

Daniel Wise can be reached at dwise@alm.com.

Links to a video explaining how to use the new voting machines and the Brennan Center complaint are posted at nylj.com.

Corporate Gove