Report

NYSTEC Testing Oversight of ES&S EVS 6.0.4.1

Prepared for:

NEW YORK STATE | Board of Elections

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NYSTEC
YOUR INDEPENDENT TECHNOLOGY ADVISOR

ACRONYMS AND TERMS	
COTS	Commercial Off the Shelf
CVE	Common Vulnerability and Exposures
DRE	Direct Recording Electronic
ES&S	Election Systems and Software, LLC.
EVS	ES&S Voting System
FCA	Functional Configuration Audit
HAVA	Help America Vote Act
NYSBOE	New York State Board of Elections
PCA	Physical Configuration Audit
SLI	SLI Compliance, a Division of Gaming Laboratories International, LLC.
TDP	Technical Data Package
VVSG	Voluntary Voting System Guidelines

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1 Introduction

The New York State Board of Elections (NYSBOE) has asked NYSTEC, as a security expert, to perform an independent review of work conducted by SLI Compliance (SLI) for the 6.0.4.1 version of the Election Systems and Software, LLC. (ES&S) EVS Voting System. Specifically, NYSTEC was tasked with reviewing SLI's functional and security tests, based on the SLI-provided source code and documentation.

The ES&S EVS 6.0.4.1 Voting System contains new devices and software, in addition to significant modifications to hardware and software from the previous NYSBOE-certified ES&S Voting System. This voting system suite consists of software applications, central count devices, and accompanying firmware, as well as commercial off the shelf (COTS) hardware and software.

This report includes:

- A summary of the current ESS EVS System in use in New York State, as well as the changes brought in by the new 6.0.4.1 version that is currently undergoing testing.
- The list of SLI deliverables reviewed by NYSTEC.
- The two discrepancies found by SLI during its testing, which remain open.
- The specific review work performed by NYSTEC.
- The issues found by NYSTEC (and its subcontractor) in its review work, as well as the resolutions to those issues.
- Risks Specific to the ExpressVote XL

2 Executive Summary

SLI tested the functionality and security of the ES&S EVS Voting System, based on VVSG version 1.0 (2005) and 2019 NYS voting laws and regulations. NYSTEC reviewed SLI's requirement mapping, test plans, test cases, discrepancies (findings) and reports. Based on that review, NYSTEC believes that SLI adequately tested the functionality and security of the ES&S EVS Voting System. Nearly all of discrepancies found by SLI during testing were adjudicated appropriately by ES&S, SLI, and the NYSBOE Operations Unit. The only remaining open discrepancies are:

ID # ESS6041-18, "Alternative Languages."

ID # ESS6041-12, "Electronic and Paper Record Display."

One discrepancy—ID # ESS6041-21, "Cryptography: Crypto mapping, FIPS Mapping, Cryptographic Software"—has been addressed via the compensating controls in place on the system. For details, see section 6.1, "Discrepancy ESS6041-21," of this report.

3 ES&S EVA 6.0.4.1 Release Description

3.1 Components in the Current NYS ES&S EVS Configuration

- **Electionware** – an end-to-end election management software application that provides election definition creation, ballot formation, equipment configuration, result consolidation, adjudication, and report creation. Composed of five software groups: Define, Design, Deliver, Results, and Manage.
- **DS200** – a paper-based polling place digital scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVRs).
- **DS850** – a paper-based polling place central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic CVRs.

3.2 Component Enhancements/Additions

- **ExpressVote XL** – a hybrid paper-based polling place voting device that provides touchscreen vote capture, incorporates the printing of the voter's selections as a CVR, and tabulates scanning into a single unit. Capable of operating in either marker or tabulator mode, depending on the configurable mode selected in Electionware.
- **DS450** – a paper-based polling place central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic CVRs.
- **Electionware Reporting Module** – used for results consolidation, Election Night reporting, and ballot/write-in adjudication. Includes a new Electionware Touch Screen Ballot module to lay out ballots for the ExpressVote XL Marker and Tabulator.

4 SLI Testing

This section reviews the various testing performed on ES&S EVS 6.0.4.1 by SLI.

4.1 Documentation Review

From SLI: "NYSBOE ESS EVS Voting System Documentation Review Test Report v1.2.pdf":

> *SLI reviewed the documentation supplied in the EVS 6.0.4.1 TDP to verify compliance against VVSG 1.0 and NY 2019 Election Law requirements. SLI traced in a set of internally developed test cases where each NY 2019 Election Law requirement is met by the vendor documentation. In addition, SLI used a set of internally developed PCA document review forms to trace and demonstrate where each VVSG 1.0 requirement is met by the vendor documentation based on changes in the TDP.*

4.2 Source Code Review

From SLI: "NYSBOE ESS EVS 6041 Voting System Source Code Review Test Report v1.1.pdf":

> *SLI conducted a source code review against the EVS 6.0.4.1 voting system. The review consisted of a comparison of the EVS 6.0.4.0 source code that previously underwent a full source code review by SLI Compliance for Federal certification against ES&S delivered EVS 6.0.4.1 source code for this New York State Board Of Elections (NYSBOE) project. All changed code was reviewed against the VVSG 1.0 requirements. All source code delivered for the EVS 6.0.4.1 project was reviewed against the NYS election code.*

4.3 Security Review Test

From SLI: "NYSBOE ESS EVS Voting System Security Review Test Report v1.1.pdf":

- *The security test suites are tests for verifying whether a voting system complies with pertinent requirements in the VVSG 1.0 and NY 2019 Election Law requirements. These suites incorporate system* security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms.
- The vendor documentation was reviewed to ensure sufficient detail is present to operate the voting system in a secured manner. Where the vendor statements assert the voting system is secured via mechanisms and seals, procedures tested the presence and effectiveness of such controls.
- The security test report identifies the specific threats that were assessed and the associated risk if a flaw or exception was identified in a voting system. The tests were designed to

ensure that the voting system meets or exceeds the security requirements in the VVSG 1.0 and NY 2019 Election Law requirements.

- Security testing included testing each individual component of the system and the system as a whole. As such, *each type of precinct device, central count device, EMS, tally, reporting application, etc., was subjected to review, as was the system as a whole and its interactions between components.*

4.4 Functional Testing

From SLI: "NYSBOE ESS EVS 6041 Voting System Functional Test Report v1.2.pdf":

1. *Evaluation of Prior VSTL EAC Certification Testing*

   The ES&S EVS 6.0.4.1 voting system is based on a branch of ES&S voting systems that originated with the fully tested and EAC certified EVS 6.0.0.0 voting system. Subsequent EAC certified versions of the EVS 6.0.0.0 voting system, EVS 6.0.2.0 and EVS 6.0.4.0, were certification tested by SLI for changes to the original fully tested EVS 6.0.0.0 voting system during each respective EAC test campaign.

2. *VVSG 1.0 "Should to Shall" Functional Testing*

   The ES&S EVS 6.0.4.1 voting system was functionally tested to a specific subset of VVSG 1.0 requirements. As required by NYSBOE, all VVSG 1.0 requirements where the word "should" appears was replaced with "shall". Custom test cases were created and executed by SLI to test this functionality.

3. *NY 2019 Election Law Functional Testing*

   As the ES&S EVS 6.0.4.1 voting system contains new devices and software in addition to significant modifications to hardware and software from the previous NYSBOE certified ES&S voting system, the full EVS 6.0.4.1 system was tested against all functional NY 2019 Election Law requirements.

5 Discrepancies Found by SLI

5.1 SLI Findings

SLI reports its testing findings as "Discrepancies." In code review, a discrepancy occurs when the source code does not meet defined requirements or specifications. In all other testing, a discrepancy occurs when an element of the voting system does not meet defined requirements or specifications.

Table 1 shows the count of each type of discrepancy reported by SLI.

TABLE 1, COUNT OF DISCREPANCIES

	FUNCTIONAL CONFIGURATION AUDIT (FCA) DOCUMENTATION	FUNCTIONAL	PHYSICAL CONFIGURATION AUDIT (PCA) DOCUMENTATION (TDP)	TOTAL
Number of Discrepancies	5	11	10	26

No security or code audit discrepancies were found. Note that this is not unexpected, as the ESS system has gone through many rounds of previous testing and updates. Table 2 shows the synopsis of each finding. Note that finding ESS6041-23 was entered by SLI in error and removed from the final discrepancy list.

TABLE 2, LIST OF DISCREPANCIES

ISSUE KEY	SUMMARY	RESOLUTION
ESS6041-27	EMS COTS in PIP do not match TDP.	This issue was resolved in the final EVS 6.0.4.1 TDP submission.
ESS6041-26	Cerberus FTP server version not supported with Windows 2008.	This issue was resolved in the final EVS 6.0.4.1 TDP submission.
ESS6041-25	WSUS offline update instruction missing.	This issue was resolved in the final EVS 6.0.4.1 TDP submission.
ESS6041-24	Windows 7 support message during workstation setup.	This issue was resolved in the final EVS 6.0.4.1 TDP submission.
ESS6041-22	EVS system lock/key combinations are not unique.	Per NYSBOE, this should be addressed by field procedures guide or similar; closing, as this is not a functional issue. Resolution was provided by NYSBOE during a call with SLI on 8/7/2020.
ESS6041-21	Cryptography: crypto mapping, FIPS mapping, cryptographic software.	Per NYSBOE, this is addressed with compensating controls. See section 6.1 of this report for more information.
ESS6041-20	Ballot approval and storage.	Per NYSBOE, a ballot, activation card, or vote summary card is considered stored as long as it is physically contained within the device. ExpressVote XL will tabulate the summary card when the cast button is pressed, just prior to the card entering the attached ballot bin or container. Since storage occurs when the card is inserted, this is not considered an issue.

ISSUE KEY	SUMMARY	RESOLUTION
		Resolution was provided by NYSBOE during a call with SLI on 8/7/2020.
ESS6041-19	Unique identifier.	Per NYSBOE, this is not applicable to ExpressVote XL. Resolution was provided by NYSBOE during a call with SLI on 8/7/2020.
ESS6041-18	Alternative languages.	This discrepancy is unresolved. Per ES&S, ExpressVote XL has been certified numerous times by the Election Assistance Commission (EAC) and several individual states as meeting the EAC Voluntary Voting System Guidelines, the Voting Rights Act of 1965 (VRA), and the Help America Vote Act of 2002 (HAVA), as well as individual state law requirements. Per NYSBOE, this is a discrepancy only when working with languages other than English. This will be brought up for further review by the commissioners.
ESS6041-17	Protective counters are not displayed at all times.	Per NYSBOE, although the requirement indicates that the counters must be located such that they are visible to the inspectors and watchers at all times while the polls are open, it is not necessary to display protective counters during the voting session, because the on-screen display during the voting session must be private. Resolution was provided by NYSBOE during a call with SLI on 8/7/2020.
ESS6041-16	Write-in stamps and stickers.	This has been closed. The intent of this requirement is to prevent a person from handing out stickers to voters to place within the write-in spot. It is not the intent of the requirement that the voting system itself prohibit the use of stickers or stamps. Resolution was provided by NYSBOE during a call with SLI and NYSTEC on 7/15/2020.
ESS6041-15	Write-in nominated candidate.	This has been closed. This requirement is for election officials rather than the voting system. Resolution was provided by NYSBOE during a call with SLI and NYSTEC on 7/15/2020.
ESS6041-14	Maximum number of ballots allowed.	This has been closed. This requirement is for the voter and voting procedures, not the voting

ISSUE KEY	SUMMARY	RESOLUTION
		system. Any voter who spoils three (3) ballots/activation cards is not eligible to receive another ballot. Resolution was provided by NYSBOE during a call with SLI and NYSTEC on 7/15/2020.
ESS6041-13	Rejected paper records.	Per NYSBOE in an email to SLI dated 8/31/2020, this issue can be closed. The necessary information is written to the log.
ESS6041-12	Electronic and paper record display.	This discrepancy is unresolved. ES&S takes exception to SLI's determination that ExpressVote XL, by definition, is considered a DRE, as indicated in its findings for § 6209.2 (f) (1) (iv). Per NYSBOE, the issue at hand is that the full ballot is shown only during the initial marking of choices; but the voter can never see the full ballot, compared with the printed choices. This will be brought up for further review by the commissioners.
ESS6041-11	PCA document review: security and integrity	This issue was resolved in the final 6041 TDP submission and closed.
ESS6041-10	Protective coverings.	This issue was resolved in the final EVS 6.0.4.1 TDP submission. "EVOTEXL_1'1'0'0_SMM.pdf" revision 1.6, released: July 27, 2020. Chapter 4: Added 4.3.3 Clean the Card Review Window – this section satisfies the requirement.
ESS6041-9	PCA Doc Review - Error recovery documentation.	This issue was resolved in the final EVS 6.0.4.1 TDP submission. "EVOTEXL_1'1'0'0_SOP.pdf" revision 1.8., released: July 27, 2020 – resolved outstanding issues.
ESS6041-8	PCA doc Review vendor-supplied records.	This issue was resolved in the final EVS 6.0.4.1 TDP submission. "ESSSYS_1'0_P_CMProgram.pdf" revision 1.4 – entire document meets this requirement.
ESS6041-7	PCA Review: test cases and sample ballots.	This issue was resolved in the final EVS 6.0.4.1 TDP submission. "ESSSYS_1'0_P_CMProgram.pdf" revision 1.4 – entire document meets this requirement.
ESS6041-6	PCA Doc Review - Procedures for module or unit testing.	This issue was resolved in the final EVS 6.0.4.1 TDP submission. "ESSSYS_1'0_P_CMProgram.pdf" revision 1.4 – entire document meets this requirement.

ISSUE KEY	SUMMARY	RESOLUTION
ESS6041-5	Typo in system overview.	This issue was resolved in the final EVS 6.0.4.1 TDP submission.
ESS6041-4	Compilers and assemblers ID missing for EVOTEXL.	This issue was resolved in revision 1.3 of EVOTEXL_1'1'0'0_SDS, section 2.5.5.2 of the EVS 6.0.4.1 TDP.
ESS6041-3	No record of tests or certificate of satisfactory completion.	Test cases were provided to NYSBOE but not to SLI. This issue was closed. New issues opened ESS6041-6, ESS6041-7, ESS6041-8 to address more specific NYS Election Law requirements.
ESS6041-2	DS200 and ExpressVote XL security seal tamper when changing thermal paper.	Per NYSBOE, this will be addressed procedurally using seal log and adding new seal. Resolution provided by NYSBOE during a call with SLI on 8/7/2020.
ESS6041-1	Incorrect COTS software listed.	The workstation setup and configuration guides were updated to list COTS consistent with what the vendor requested that SLI obtain in advance of the setup process.

For more information on each discrepancy, see file SLI Attachment B – Discrepancy Report.pdf.

6 Open Discrepancies

Each SLI discrepancy was either found to be resolved or remediated by ES&S, with the exception of the following:

- ESS6041-21, Cryptography: crypto mapping, FIPS mapping, cryptographic software.
- ESS6041-18, Alternative languages.
- ESS6041-12, Electronic and paper record display.

ESS6041-21 has been closed, due to the mitigating controls in the system that keep the issue from causing a problem (see section 6.1 for more information). ESS6041-12 and ESS6041-18 remain open (see sections 6.2 and 6.3 for more information).

6.1 SLI Discrepancy ESS6041-21

6.1.1 Overview

SLI discrepancy ESS6041-21 is due to certain system cryptography that not been approved by the U.S. government's Crypto Module Validation Program (CMVP), which is required by NYS voting regulation 6209.2.F.10a. Not adhering to CMVP has been acceptable previously in voting system certifications, when the risk of exposure was able to be compensated by other controls in the system. NYSTEC, after following the process as has been done in the past, believes that the list of controls provided by SLI satisfactorily mitigates the issue, and thus recommends that this discrepancy does not prohibit certification of the system.

6.1.2 Discrepancy

From SLI documentation:

> ***Finding ID**: ESS6041-21*
>
> ***Summary**: Cryptography: Crypto mapping, FIPS Mapping, Cryptographic Software*
>
> ***Status**: Discrepancy Addressed*
>
> ***Issue Type:** FCA Documentation*
>
> ***Requirement #(s) & Text:** 6209.2.F.10a (i) All cryptographic software in the voting system shall have been approved by the U.S. Government's Crypto Module Validation Program (CMVP) as applicable.*
>
> ***Description**: Cryptographic usage that the CMVP validation wasn't able to be determined was the utilization of cryptographic functionality for three pieces:*
>
> *1) PostgreSQL: was unable to determine if the MD5 Hashing of database passwords referenced from ES&S documentation utilizes FIPS mode RSA/OpenSSL encryption calls*
>
> *2) ES&S Linux based on Yocto 2.0: cryptographic usage at the operating system level was not confirmed to be using FIPS validated cryptographic calls for Operating system level cryptographic calls.*
>
> *NOTE: it should be noted that the operating system itself controls the API's and usage of the election system that contain the FIPS validated module calls as part of the election specific programming. the environment itself is setup per the Security specifications for Single user mode, and controls access to the software that houses the modules. The operating systems form almost a KIOSK mode where*

there is no found way to be able to login to the operating system directly to manipulate or modify the election software that contain the encryption modules.

this includes access to any of the found username/password hashes found in the shadowed password files located on the system storage media.

3) ES&S Linux 6.2 based on Linux from Scratch 6.2.5: cryptographic usage at the operating system level was not confirmed to be using FIPS validated cryptographic calls for Operating system level cryptographic functions.

NOTE: it should be noted that the operating system itself controls the API's and usage of the election system that contain the FIPS validated module calls as part of the election specific programming. the environment itself *is setup per the Security specifications for Single user mode, and controls access to the software that houses the modules. The operating systems form almost a KIOSK mode where there is no found way to be able to login to the operating system directly to manipulate or modify the election software that contain the encryption modules.*

Resolution

Per NYSBOE, this is addressed with compensating controls.

6.1.3 Previous Guidance

During voting system certification in 2010, clarification of regulation 6209.2.F.10a (i) was requested by ES&S in the form of a Request For Information (RFI) to NYSBOE. The RFI response can be found here: https://www.elections.ny.gov/NYSBOE/hava/RFI/NYSTECResponseRFICryptography8232010Rev42.pdf

The response concerns cryptography in source code, but the concept is transferrable to cryptography that is part of executable software on the voting system (i.e., COTS). Essentially, there are certain situations where the requirement can be ignored. These exceptions are as follows, from the RFI response:

Group 1: ***Code within a system that is not utilized within the New York configuration****. In this group, ES&S has identified findings where non-CMVP approved cryptographic software was used and has requested the findings be closed because the code is not executable in the NYS configuration. NYSTEC believes that cryptographic software that is not utilized within the NY configuration and is not CMVP approved can be allowed to exist within the system and will not pose a significant security risk. NYSTEC recommends however that ES&S, in the next version of NYS software, either remove unused code from the source or conditionally compile it out. This provides for more manageable code and adheres to good coding practices.*

Group 2: ***Code within a system that performs cryptography where cryptographic usage is not required****. In this group, ES&S has identified findings where non-CMVP approved cryptographic*

software was used and has requested them to be excluded because they believe it was used where encryption was not required. NYSTEC believes that the existence of non-CMVP approved cryptographic software in places where encryption is not required does not pose a significant security risk and may even improve security vs. not encrypting the data. Several of the Group 2 findings identified by ES&S have been shown to implement encryption or hashing in places where it was unnecessary as per NYS requirements and past NYSTEC guidance to the vendor. This would include the encryption of data that is not passed to or from the precinct site or that is maintained only within the Election Management System. NYSTEC has completed a review of the relevant code modules and function calls and we agree in many instances with the vendors' claim that these findings represent the use of cryptography where it was not required.

Thus, based on the precedent, the discrepancy is not relevant if:

- The cryptography exists on the system, but is not used (Group 1); or
- The cryptography is in use in a situation in which cryptography is not required, but adds to the overall security of the system (Group 2).

As per page 4 of the RFI response, cryptography is required when:

- Calculating checksums, or hashes, that are used as part of software validation only.
- Encrypting data that is required to be encrypted, as per past NYSTEC guidance.
- Authenticating—hashing of passwords is one example.
- Generating random numbers.
- Generating digital signatures.

6.1.4 Analysis of Discrepancy, Based on Previous Guidance

Two of the items identified in ESS6041-21 are as follows:

- #2 Linux based on Yocto 2.0 (DS450, ExpressVote XL).
- #3 ES&S Linux 6.2 based on Linux from Scratch 6.2.5 (DS200, DS850).

These items fall into Group 1, as there are no user logins to the systems in question, and cryptography calls are not relevant in these cases. Thus, they can be ignored.

The last item identified in ESS6041-21 is as follows:

- #1 PostgreSQL: was unable to determine if the MD5 Hashing of database passwords referenced from ES&S documentation utilizes FIPS mode RSA/OpenSSL encryption calls.

The authentication provided by the PostgreSQL running on the Election Management System (EMS) is used by the system; as such, this item does not fall into either Group 1 or Group 2. Failures of this type have been accepted by NYSBOE before, as long as there have been compensating controls built into the

system. After reviewing the list of controls (see section 6.1.5, "List of Compensating Controls"), NYSTEC believes the controls satisfactorily protect the PostgreSQL. Thus, NYSTEC recommends that this discrepancy does not prohibit certification of the system.

6.1.5 List of Compensating Controls

System Security

- The EVS 6.0.4.1 Electionware EMS runs only on dedicated hardened systems configured to include the essential services, applications, utilities, and settings required to operate the system. The hardening process turns the server into a single-use device, dedicated solely to creating and operating elections. ES&S follows the Defense Information Systems Agency (DISA) Security Technical Implementation Guide (STIG) for the hardening of these critical systems. As an added protection, the installations and hardening procedures are performed by ES&S Technical Services professionals, ensuring that the systems are implemented in a fully hardened certified configuration.
- Electionware is protected by two-factor authentication using Windows BitLocker.
- User Authentication includes the following:
  - All Electionware laptops, workstations, clients, and servers require login credentials before operation can begin. All failed login attempts are logged.
  - Electionware requires usernames and passwords to launch the EMS application. The restricted user roles segregate which features are accessible.
  - By default, Electionware Windows passwords expire every 60 days as an additional security measure to limit the possibility of unauthorized access to the system. Changes to this policy can be performed only by the system administrator.

Physical Access Control

- County election officials are required to implement a strong physical and procedural security plan that limits Electionware EMS access to authorized personnel only.
- Electionware laptops, workstations, clients, and servers are kept in a controlled environment that limits physical access to the system and unauthorized access to the EMS network.

Audit Logging

- Electionware saves a record of all user actions with usernames to the system audit log. Electionware maintains an audit log that shows all system processes. This audit log can be filtered by date and type of event.
- The log can be printed or saved in a variety of file formats, including .pdf, .rtf, .html, .xls, and .csv. The log operates during all processes, including results processing. Optionally, log

events can be viewed in real time via the output window, which displays errors in red text, warnings in blue text, and normal events in black text.

- Audit records created during the election definition and ballot preparation include records for all steps in the finalization of the ballot layout. These records are date/time stamped and include a description of the action and the module in which the action occurred. Audit reports can be filtered by date and event type, and they can be sorted by ascending or descending timestamps.
- Audit logs on the EMS server cannot be modified either in Electionware or PostgreSQL.

6.2 SLI Discrepancy ESS6041-18

6.2.1 Overview

SLI discrepancy ESS6041-18 is due to the inability of ExpressVote XL to print the activation card in in the language chosen by the voter. The activation card prints only in English, which does not meet NYS requirement 6209.2.F.3. Although ES&S ExpressVote XL has been certified by the EAC, certified by several states, and meets the federal requirement and guidelines, it does not meet this NYS requirement. Per NYSBOE, this discrepancy is applicable to languages other than English and should be brought to the NYS commissioners for further review. NYSTEC agrees with this approach.

6.2.2 Discrepancy

From SLI documentation:

> ***Finding ID**: ESS6041-18*
>
> ***Summary**: Alternative Languages*
>
> ***Status**: Open*
>
> ***Issue Type:** Functional*
>
> ***Requirement #(s) & Text:** 6209.2.F.3 The voting system shall display, print, and store a paper record in any of the alternative languages chosen for making ballot selections. Candidate names and other markings not related to the ballot selection on the paper record shall appear in English.*
>
> ***Description**: Ballots and activation cards created for the State of New York shall display, print, and store a paper record in any of the alternative languages chosen when voting a ballot or activation card. Candidate names and other markings not related to the ballot selection on the paper record shall appear in English. Expected Results: A activation card created on the ExpressVote XL, shall*

display, print, and store the activation card in the language chosen. Observed Results: The activation card is always printed in English, no matter which language is selected.

***Resolution**: This discrepancy is unresolved. Per ES&S, the ES&S ExpressVote XL has been certified numerous times by the Election Assistance Commission (EAC) and several individual states as meeting the EAC Voluntary Voting System Guidelines, the Voting Rights Act of 1965 (VRA) and the Help America Vote Act of 2002 (HAVA) as well as each individual state law requirements where the ExpressVote XL has been certified. Per NYSBOE, this is only a discrepancy when dealing with languages other than English. This will be brought up for further review by the commissioners.*

6.3 SLI Discrepancy ESS6041-12

6.3.1 Overview

SLI discrepancy ESS6041-12 identifies that ExpressVote XL does not meet the requirement to allow the voter the ability to easily read and compare a paper ballot to the electronic display due to a partial obstruction caused by the "Cast Ballot" popup message. Per NYSBOE, it is problematic that the full ballot is shown only initially, when the voter is marking choices, and is not fully shown for verification after the voter prints the selections. NYSBOE is requesting further review by the commissioners, which NYSTEC supports.

Per NYS regulations, there must be a paper record of user selections. The activation card acts as that record, but it does not contain the full ballot—only the voter's selections, rather than all candidates, are printed on the card. Thus, the system should allow the voter to compare the selection printed on the card to the full ballot, giving the voter the opportunity to verify that the card does indeed represent the voter's desired selection. The following are examples for situations that may cause voter confusion:

1) The voter voted for candidate based on party, not on name
2) The voter voted for proposition based on text of proposition on the display, which does not appear on the card
3) Two candidates in a race have similar names

From SLI documentation:

***Finding ID**: ESS6041-12*

***Summary**: Electronic and Paper Record Display*

***Status**: Open*

***Issue Type:** Functional*

Requirement #(s) & Text: *6209.2.F.1.iv In the case of a DRE voting system, the paper and electronic display of the voter's selections shall be presented and positioned so as to allow the voter to easily read and compare the two.*

Description: *For the ExpressVote XL, there shall be a means for the voter to observe the paper and electronic records of the voter's selections. The voter shall be capable of comparing the two. However, within the XL device when the paper ballot is printed and displayed to the voter, the electronic record is partially obstructed. Expected Result: The user is capable of easily reading and comparing the paper and electronic display of the voter's selections. Observed Result: When the ballot is generated and displayed behind the glass pane, the electronic record, or on-screen display, is partially covered by the "Cast Ballot" popup. This prevents the voter from accurately comparing the electronic ballot to the physical ballot.*

Resolution*: This discrepancy is unresolved. ES&S takes exception to SLI's determination that the ExpressVote XL, by definition, is considered a DRE as indicated in its findings for § 6209.2 (f) (1) (iv).Per NYSBOE, the issue at hand is that the full ballot is only shown during the initial marking of choices, but the voter can never see the full ballot compared with the printed choices. This will be brought up for further review by the commissioners.*

7 NYSTEC Activities

NYSTEC performed the following activities in the oversight of the testing conducted by SLI:

1. NYSTEC was asked by NYSBOE to bring in a subcontractor to review the initial source code review performed by SLI on ES&S EVV 6.0.4.1. NYSTEC contracted with the firm AtSec to review the test plan and the results of the SLI code review testing. See section 9.1, "Overview of Findings from AtSec," for more information.
2. NYSTEC reviewed list of requirements, supplied by SLI, from the VVSG 1.0 and NYS 2019 Election Law to ensure all applicable requirements were accounted for in testing. After review and consulting with the NYSBOE Operations Unit, NYSTEC sent comments and questions to SLI. SLI responded, and there were several iterations of discussions until the list was agreed upon by SLI, NYSTEC, and the NYSBOE Operations Unit. See the file "SLI Attachment A – New York Requirements Matrix EVS 6.0.4.1.xls" for the final version of requirement mapping.
3. NYSTEC retained Cyber Castellum as the code review subcontractor for the secondary code review performed by SLI. Both NYSTEC and Cyber Castellum reviewed the original draft and then responded with comments and questions. Based on those comments, SLI submitted a final version. See the file "ESS EVS6041 Voting System Specific Test Plan Phase 2 v1.1.pdf" as well as section 9.2, "Overview of Findings from Cyber Castellum," for more information.
4. NYSTEC reviewed the following test plans:

- "ESS EVS6041 Voting System Specific Test Plan Phase 2 v1.1.pdf."
- "ESS 6.0.4.1 Voting System Specific Security DRAFT Test Plan v1.0.pdf."

5. NYSTEC reviewed the test cases. The review verified the mapping of the requirements to the following test cases:
   - ES&S EVS 6041 Functional Test Cases Phase 2 (see file "ES&S EVS 6041 Functional Test Cases Phase 2.pdf"). NYSTEC reviewed 10% of the functional test cases. See section **Error! Reference source not found.**, "**Error! Reference source not found.**" for more information.
   - ES&S EVS 6041 Documentation Test Cases Phase 2 (see file "ES&S EVS 6041 Documentation Test Cases Phase 2.pdf").
   - ES&S EVS 6041 Security Test Cases Phase 2 (see file "ES&S EVS 6041 Security Test Cases Phase 2.pdf"). See Section **Error! Reference source not found.** for more information.
6. NYSTEC had Cyber Castellum perform an analysis on SLI's secondary code review.
   - Cyber Castellum reviewed the NYSBOE EVS 6.0.4.1 Source Code Review Report (see the file "NYSBOE ESS EVS 6041 Voting System Source Code Review Test Report v1.1.pdf") and created its own report (see the file "Static Code Analysis Inspection Report-Final Draft.pdf").
   - NYSTEC reviewed the Cyber Castellum report and worked through each finding with ESS. See section 9.2, "Overview of Findings from Cyber Castellum."
7. NYSTEC reviewed discrepancy reports from SLI as they were received, and then worked with the NYSBOE Operations Unit, SLI, and ESS to resolve those discrepancies (see the file "SLI Attachment B – Discrepancy Report.pdf").
8. NYSTEC reviewed final reports from SLI:
   - Overall Test Report (see the file "NYSBOE ESS EVS 6041 Final Test Report v1.2.pdf"). No issues were found.
   - System Documentation Review Test Report (see the file "NYSBOE ESS EVS Voting System Documentation Review Test Report v1.2.pdf") – compared ES&S TDP updates to SLI discrepancies. No issues were found.
   - System Functional Test Report (see the file "NYSBOE ESS EVS 6041 Voting System Functional Test Report v1.2.pdf"). No issues were found.
   - System Security Review Test Report (see the file "NYSBOE ESS EVS Voting System Security Review Test Report v1.1.pdf"). No issues were found.

8 Issues Found in Test Plans and Test Cases

This section shows an overview of the issues NYSTEC found in the test plans and test cases provided by SLI, along with SLI responses and final resolution of the issues.

8.1 Test Plans

The two test plans were iterated between NYSTEC and SLI. Note that the iterations are not documented in this report. For the full text of each test plan, see the following files:

- "ESS EVS6041 Voting System Specific Test Plan Phase 2 v1.1.pdf."
- "ESS 6.0.4.1 Voting System Specific Security DRAFT Test Plan v1.0.pdf."

NYSTEC subcontractor Cyber Castellum reviewed the Code Review Plan, which was part of the Voting System Specific Test Plan (see the file "ESS EVS6041 Voting System Specific Test Plan Phase 2 v1.1.pdf"). Cyber Castellum's findings are shown in **Error! Reference source not found.**.

TABLE 3, NYSTEC RESPONSE TO CODE REVIEW PLAN

NYSTEC COMMENT	SLI RESPONSE	RESOLUTION
From Cyber Castellum: *The automated code review process as documented in the Test Plan does not sufficiently cover security. The checks performed by the Understand tool are code quality checks and the Clang Static Analyzer does perform some security checks. The checks for majority of the security vulnerabilities are to be performed through manual processes. The checks for vulnerabilities outlined in the test plan are not tailored to specific languages thus requiring the code reviewer to have deep knowledge of the programming language and security vulnerabilities.* *We will have to perform code review of at least a portion of the modified code to determine the effectiveness of the*	NYSTEC believes, and has recommended to NYSBOE, that because the second code review is limited to the delta of the changes from previous versions of the EVS 6000 family, and because the number of lines of code to review is not overwhelming, manual review is sufficient for this current testing.	Cyber Castellum, in its oversight testing, used stronger code scanning tools designed for security against the entire code base and did not find any significant findings.

NYSTEC COMMENT	SLI RESPONSE	RESOLUTION
code review process documented in the test plan. It is very difficult.		

8.2 Test Cases

NYSTEC reviewed the test cases provided by SLI. For full text of all test cases, see the following files:

- "ES&S EVS 6041 Functional Test Cases Phase 2.pdf."
- "ES&S EVS 6041 Security Test Cases Phase 2.pdf."
- "ES&S EVS 6041 Documentation Test Cases Phase 2.pdf."

For the issues found by NYSTEC in the test cases, see Table 4. All issues documented by NYSTEC were resolved.

TABLE 4, ISSUES FOUND BY NYSTEC IN TEST CASES

NYSTEC COMMENT	SLI RESPONSE	FINAL RESOLUTION
There is an inconsistent use of "ballot" in the ExpressVote test cases. Sometimes it seems to be the ballot image in the EMS, sometimes it is the ballot image on the ExpressVote monitor, sometimes it seems to be the activation card, and sometimes it is not clear (C40262 is an example). Clarity and consistency must be given to when "ballot" is used in any NYS law or regulation on what exactly that applies to on ExpressVote. This may need to come from ESS. It is up to ESS to define these items, but they must note that for ExpressVote: • Ballot/activation card does not match requirements of official ballot (NYS Law 7-102) and all elections must have a ballot (NYS Law 7-100), so if any of the requirements for "ballots" are being tested on how the ballot/activation card manages the requirement, that should be	This was corrected in the test cases.	NYSTEC verified that the phrase "activation card" was used when referring to the card.

NYSTEC COMMENT	SLI RESPONSE	FINAL RESOLUTION
reviewed. (It should be tested on the screen of ExpressVote). • The ballot (activation) card must pass all NYS VVPAT requirements, because the system must have a VVPAT (6209.2.f.1). If ESS wishes to define the items otherwise, they must discuss with NYSBOE.		
C40229 – All non-names must be translated to the selected language on the card, if they refer to the voter's selections. Thus, if it doesn't already, this needs to test: • Propositions to ensure all words such as "Proposition," "Yes," and "No" are printed on the card in the selected language. • The phrase printed on the card for when the voter makes no selection for a race (office) or a proposition.	The test case was corrected by SLI.	NYSTEC verified that the test case was corrected. Note that this case resulted in finding ESS6041-18.
C40279 and C40280 – When ExpressVote is used to count votes (the card is not ejected for the voter to scan manually or used as a scanner when the voter inserts the card printed with selections), this test needs to see what happens if the card jams in the tube on the way to storage, after it has moved past the scanner. For the DS250, the same with a paper ballot.	The test case was corrected by SLI.	NYSTEC verified that the test case was corrected. Note that this test case resulted in finding ESS6041-20.
C40092 – This states that after selecting "Spanish" as the language, the tester must verify that the "Ballot prints in English only and does not identify the voter." This is incorrect. The card must print in Spanish, whether it is considered a VVPAT or a ballot (6209.2.A.2, or 6209.2.F.3, respectively) The requirement is that after the ballot is scanned and stored, no one could know if the voter chose an alternate language. The electronic audit record could show that someone used an	Test case was corrected by SLI.	NYSTEC verified that the test case was corrected.

NYSTEC COMMENT	SLI RESPONSE	FINAL RESOLUTION
alternate language, and the card would show that as well, but there must be no way to tie the audit record or the card to a voter.		
C40065 – The test case does not test the last statement in NYS Law 9-214: "…and if the county contains more than one assembly district or parts of more than one assembly district, a statement of the number of votes cast for governor by assembly district."	The test case was corrected by SLI.	NYSTEC verified that the test case was corrected.
C41994 – 6209.3.A.3 says the system must count votes. According to NYS Election Law, section 9-112. 9-112: "4. If, in the case of a candidate whose name appears on the ballot more than once for the same office, the voter shall makes a cross X mark or a check V mark in each of two or more voting squares before the candidate's name, or fill in two or more such voting squares only the first vote shall be counted or such candidate. If such vote was cast for the office of governor, such vote shall not be recorded in the tally sheet or returns in a separate place on the tally sheet as a vote not for any particular party or independent body." The test case does not state that the tester should confirm, in the instance of voting for the same candidate for governor twice, that the vote is recorded not in the party total but on a total all its own. This is also not tested in C40065.	Removed. This was a NYSTEC misinterpretation of the law.	N/A

9 Issues Found in Reports

NYSTEC reviewed the final reports that SLI delivered in March 2020. NYSTEC responded with changes and suggestions that could be incorporated into the next phase of functional testing and the security review.

For full text of the final reports, see the following files:

- "NYSBOE ESS EVS 6041 Final Test Report v1.2.pdf."
- "NYSBOE ESS EVS Voting System Documentation Review Test Report v1.2.pdf."
- "NYSBOE ESS EVS 6041 Voting System Functional Test Report v1.2.pdf."
- "NYSBOE ESS EVS Voting System Security Review.pdf."

The only final reports with issues that needed additional research were from code review testing. There were two rounds of testing. The first was captured in the report delivered in spring 2019. Under NYSBOE direction, NYSTEC hired AtSec as a subcontractor to perform an analysis of the SLI code review testing. The second round occurred in spring 2020. Under NYSBOE direction, NYSTEC hired Cyber Castellum as a subcontractor to perform an analysis of the SLI code review testing.

9.1 Overview of Findings from AtSec

As part of its obligation for security oversight, NYSTEC was asked to hire an experienced vendor to review SLI's first code review. NYSTEC retained AtSec. Although it determined there were insufficient artifacts from SLI to perform a complete review, AtSec was able to perform a spot-check of the code, which resulted in 25 findings (see the file "ES&S_EVS_6041_Code_Review_Analysis_FINAL_1.0.pdf").

NYSTEC analyzed these findings, which in many cases were due to insufficient artifacts provided by SLI to AtSec. SLI provided those artifacts, and then the findings were closed. Other issues are discussed in Table 5:

TABLE 5, ISSUES FOUND BY ATSEC

TYPE OF ISSUE	RESPONSE FROM SLI	RESOLUTION
It was determined that SLI, as part of testing Part 6209.2 F (10) (i) ("All cryptographic software in the voting system shall have been approved by the U.S. Government's Crypto Module Validation Program (CMVP) as applicable"), verified that the system was using FIPS-certified software but did not verify that the software was used correctly, as per the FIPS certification.	After further testing, SLI discovered that the ESS ExpressVote XL device was not using the software correctly in FIPS mode. ESS was notified of this and a change was made to the code, which was retested in Phase 2.	Issued fixed by ESS and retested by SLI in the second code review.
There seemed to be a "debug code" message that showed cryptographic keys to screen.	SLI responded that the code was discovered but not documented, as it was not an issue.	Reviewed by SLI and found not to have any issues.

TYPE OF ISSUE	RESPONSE FROM SLI	RESOLUTION
AtSec found several of the code libraries used in the ESS code had known vulnerabilities.	AtSec used Common Vulnerability and Exposures (CVE) lists that were not in SLI List of "Known vulnerabilities."	SLI reviewed the list provided by AtSec and found the vulnerabilities did not pose any issues in the code.
Issues of possible dangerous calls in the "C" language and Java languages.	SLI responded that the code was discovered but not documented, as it was not an issue.	These had already been reviewed by SLI and found not to be dangerous.
Code review did not include SQL (database) code.	SLI believed that the SQL code was out of scope.	Retested by SLI in the second code review and found to not have any issues.

9.2 Overview of Findings from Cyber Castellum

All issues found by Cyber Castellum were resolved (see the file "Static Code Analysis Inspection Report - Final Draft.pdf" for the complete Cyber Castellum report). No issues were found that required any code changes from ES&S. See Table 6 for a synopsis of the issues found by Cyber Castellum.

TABLE 6, ISSUES FOUND BY CYBER CASTELLUM

TYPE OF ISSUE	RESPONSE FROM SLI	RESOLUTION
There were items found that the SLI plan specifically looked for, but were not reported by SLI.	The tool used by SLI ("Understand") did not return the same results as the Cyber Castellum tool.	Findings by Cyber Castellum were manually found not to pose any risk to the system.
Violation of VVSG standard.	SLI used the ESS coding standard, which violates (that is, is in conflict with) the VVSG coding standard in some regards.	Findings by Cyber Castellum do not pose any risk to the system.
Failure found in code for a specific vulnerability for which SLI was testing.	SLI stated that this vulnerability is related to online software. This system is not online and as such does not contain this vulnerability.	Findings by Cyber Castellum are not an issue.

TYPE OF ISSUE	RESPONSE FROM SLI	RESOLUTION
Many known vulnerabilities included in open source and third-party code libraries were not assessed.	From SLI: *"During our investigation of the systems and COTS software, a number of these came up. Reading through these, it was determined that a number of them are susceptible to remote attackers, when exposed on an open network. The voting system is on a closed network, so they were considered negligible, or there were no known exploits, etc."*	Findings by Cyber Castellum are not an issue.
"Dangerous" functions that Microsoft says should not be used.	From SLI: *"We were aware of the items listed in the table. However, our analysis found them to be wrapped in code that negated improper use, so we didn't report them."*	Findings by Cyber Castellum are not an issue.

10 Risks Specific to ExpressVote XL

As part of due diligence and because threats and flaws, whether real or perceived, can contribute to public perception of risk, NYSTEC researched public response, criticism, and possible flaws regarding ExpressVote XL. These articles, which were published on the internet and in other sources, discuss previous versions of ExpressVote XL, which are in used in other states. Although those previous versions were not the one tested by SLI for use in New York State, there was relevant information uncovered in that research regarding potential risks in the current version of ExpressVote XL.

This section provides an overview of those potential risks.

10.1 Barcodes

There has been much criticism of ExpressVote XL due to the device tabulating votes by reading the barcode on the activation card, which the voter cannot read, rather than tabulating by voter selections printed as text on the card. This situation creates an opportunity for system errors from:

- Printing the barcode.
- Reading the barcode.
- Altering the barcode after printing.

Such system errors would be undetectable by any person examining the card, and could lead to miscounted votes.

Barcode scanners and ballot scanners are both in use in New York State, and both require a level of expectation from user that the devices process voter data accurately. This expectation comes from all the testing of the system that shows no indication that the barcode or oval placement has been compromised, and that all systems are tested before very election to validate accurate vote counting and audited after an election to ensure the system operated correctly. For the ExpressVote, the user expects that the device accurately converts voter selections, prints the barcode, scans the barcode, and tabulates the voter selections. For ballot scanners, the user expects that the device accurately counts the filled in selections on a paper ballot. In both situations, the system could have errors (such as a malfunctioning scanner sensor or a programmatic logic issue) or could be compromised in some other way that would cause issues with the results.

To assure that barcode scanners and paper ballot scanners are correctly tabulating voter data, a post-election manual audit is required: the cards/ballots against the count totals from the barcode/ballot scanners. Specifically for the barcode scanner audit, as long as the audit tallies only the printed text selection on the card (which, presumably, the voter has verified to be correct), an incorrect barcode would be revealed when totals of the manual card count do not match the totals from the device. This, in turn, would open an investigation as to why the barcode was incorrect (or why the scanning device misread the barcode). Such would be the case whether the barcode was printed incorrectly due to a machine error, an incorrect election/ballot setup, or an alteration after the card was printed.

NYSTEC feels that the largest impact of this threat could be in public confidence of the system, as it is a change in technology from the optical mark ballot scanner solutions which have been in use for years.

10.2 Shared Printer and Scanner Path

Several articles pointed out that the activation card used by ExpressVote shares the same physical path when the card is being printed as when it is being scanned. The risk is that the printer could print on a card as it is being scanned (and counted) and could potentially change the user's selections, such as through the following situations:

- **Adding new barcodes to the card** – An original release of ExpressVote left blank space after the series of barcodes printed by the device onto the card, which would be used by the scanner to count voter selections. Critics claimed that new barcodes that do not match voter selections could be printed in this blank space. Such new barcodes could potentially tabulate selections in races for which the user did not vote or perhaps the additional barcodes could confuse the system to add votes to candidates not selected by the user.

  The version of ExpressVote tested by SLI for use in New York State fills in this space with "X"s when the card is printed, thus this risk is not present in the NYS version of ExpressVote XL.

- **Altering barcodes** – The barcode standard used by ExpressVote allows the possibility of changing the barcode to create a new valid barcode. Although the barcode standard has

integrity checks built in, the standard used by ExpressVote leaves the possibility of altering a barcode to a new value after the barcode has been printed.

As discussed in Section 10.1 above, this risk is no different than a scanner misreading a user's filled-in selection on a paper ballot, which would be revealed in a post-election audit.

10.3 Voters Do Not Review Paper Audit Trails

One of the objections to systems such as ExpressVote XL is the ongoing debate regarding systems that use a voter verified paper audit trail (VVPAT). (Note: Although the printed activation card in ExpressVote XL is not formally called a VVPAT, the idea is the same.) Studies show that many voters, after making selections on the display screen, do not check the printed paper trail to confirm that their selections are reflected correctly. The only solution to this issue is voter education, including reminders to voters that they should verify their votes on the printed card.

10.4 Alternative Languages Do Not Print on Activation Card

It has been published that when the voter selects an alternate language (such as Spanish), the text on the printed activation card is in English rather than the selected language. This was verified by SLI during testing and is detailed in the open SLI Discrepancy ESS6041-18 (see Section 6.2, "SLI Discrepancy ESS6041-18," above).

10.5 Integrated Zebra Technologies, QR Code Scanner

In an email received by Commissioner Douglas Kellner, Kevin Skoglund stated the following potential issue with ExpressVote XL:

> *The EAC certification for ES&S EVS 6.0 lists "COTS Hardware" which includes: "Zebra Technologies, QR code scanner (Integrated), DS457-SR20009". It appears that this barcode scanner is integrated into the ExpressVote XL and into ExpressVote HW 2.1. If so, and if it is the commercial off-the-shelf (COTS) version as the EAC document indicates, then its operation can be modified by scanning configuration barcodes.*
>
> *These configuration barcode are not secret. Zebra publishes them in their online manuals. They can reconfigure which types of barcodes the scanner reads, how it reads them, and how it processes them. They could cause the barcode scanner to stop tabulating ExpressVote barcodes or to tabulate them incorrectly. They can even be used to allow sending unintended data and keyboard commands to the voting system. A set of carefully constructed keyboard commands could be used to manipulate the voting system software.*

> *The ExpressVote XL and the ExpressVote HW 2.1 immediately scan every inserted ballot card. They scan barcodes to detect ballot style information on new ballot cards. They scan ballot style and ballot selection barcodes from printed ballot cards to enable voter review. A ballot card pre-printed with configuration barcodes could be submitted by any voter while inside the privacy of the voting booth.*

TJ Burns from ESS responded with an email that stated:

> *The ExpressVote XL uses a Contact Image Sensor (CIS) in the Paper Path Module. When a card is inserted, the CIS captures an image of the card to allow it to determine whether it is voted or unvoted by evaluating whether certain barcodes are present and valid for the election. Additionally the CIS scans the card as it is being printed to allow the XL's software to validate that the barcodes have printed successfully, provide readback of the selection as represented by the barcodes, create a Cast Vote Record, and store the image as a data artifact. The CIS used is the same technology used on the DS200 but is a smaller version since it need only image a 4.25" card rather than an 8.5" ballot.*
>
> *Unlike the standard ExpressVote that is certified and marketed outside of the State of New York, the XL currently does not support the Zebra DS457 or any additional scanner – internally integrated or externally attached – for ballot activation.*

After reviewing the 6.0.4.1 Technical Data Package (TDP) for ExpressVote XL, NYSTEC found that Zebra DS457 is not listed as a component. As stated in "Approved Parts List: ExpressVote XL HW Rev 1.0" (file "EVOTEXL_1'0_L_APL.pdf"), the scanner component is "Pb-free CIS,SL6R108X-160721,108mm, single light." Therefore, the issue Kevin raised is not present in the system SLI tested for use in New York State.

10.6 "AutoCast" (Cast Ballot Without Viewing Card)

Articles were published about ExpressVote use in Johnson County, Kansas, which had an option that allowed the voter to "AutoCast" the ballot without first printing and inspecting it. Since the card is used both to count the vote and is the required paper audit trail of the vote, such an "AutoCast" makes it impossible to detect any machine error or other compromise that could allow the device to compute the voter selections incorrectly.

NYSTEC had SLI verify that the "AutoCast" functionality is not available in the 6.0.4.1 system, and is therefore not a risk in New York State, so long as the feature remains not available.

11 Documents Referenced

Documents referenced in NYSTEC's review of the ES&S EVS 6.0.4.1 test plans can be found in Table 7.

TABLE 7, LIST OF REFERENCED FILES

SLI Test Plans, Test Cases, and Requirements Mapping	
ESS EVS6041 Voting System Specific Test Plan Phase 2 v1.1.pdf	ESS 6.0.4.1 Voting System Specific Security DRAFT Test Plan v1.0.pdf
ES&S EVS 6041 Documentation Test Cases Phase 2.pdf	ES&S EVS 6041 Security Test Cases Phase 2.pdf
ES&S EVS 6041 Functional Test Cases Phase 2.pdf	SLI Attachment A – New York Requirements Matrix EVS 6.0.4.1.xls
SLI Test Reports	
NYSBOE ESS EVS 6041 Final Test Report v1.2.pdf	NYSBOE ESS EVS Voting System Documentation Review Test Report v1.2.pdf
NYSBOE ESS EVS Voting System Security Review Test Report v1.1.pdf	NYSBOE ESS EVS 6041 Voting System Source Code Review Test Report v1.1.pdf
SLI Attachment B – Discrepancy Report.pdf	NYSBOE ESS EVS 6041 Voting System Functional Test Report v1.2.pdf
SLI Test Case Results and Notes	
EVS 6.0.4.1 NY 2019 Election Law Security Test Run Outline - TestRail.pdf	
Reports from NYSTEC Subcontractors	
ES&S_EVS_6041_Code_Review_Analysis_FINAL_1.0.pdf	Static Code Analysis Inspection Report -Final Draft.pdf
Online References	
https://www.elections.ny.gov/NYSBOE/hava/RFI/NYSTECResponseRFICryptography8232010Rev42.pdf	

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