U.S. ELECTION ASSISTANCE COMMISSION
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Washington, DC 20001

U.S. Committee on House Administration, Elections Subcommittee
Hearing on Examining Best Practices for Strengthening Election Security

Testimony: Benjamin Hovland, Commissioner, U.S. Election Assistance Commission

May 20, 2026

Chairwoman Lee, Ranking Member Sewell, and members of the Subcommittee, thank you for the opportunity to appear before you to discuss this important topic and the work of the U.S. Election Assistance Commission (EAC).

When Congress created the EAC with the Help America Vote Act of 2002 (HAVA), it charged the agency with a clearinghouse function to look at best practices across the nation. The EAC has embraced this part of our mission in recent years, particularly as election administration has evolved. My colleagues and I work with state and local election officials from all 50 states, five territories, and the District of Columbia. From that experience, I can confidently say that no one cares more about the security and integrity of our elections than the Americans who run them.

The challenges faced by election officials today would have seemed nearly unimaginable to the officials serving when HAVA passed. The reality is that administering elections is harder and more expensive than it has ever been before. Our state and local election officials do an amazing job with limited resources. In the years since HAVA, Congress has provided significant funding, which helps support essential aspects of elections such as secure and accessible voter registration, accurate ballot tabulation, auditable results, and safe and secure election facilities. Federal funding, however, has covered less than 5% of the estimated total cost of running elections during that time.

Similarly, the EAC tries to help fill some of those gaps but is often limited by our level of funding. Last fiscal year, the EAC saw a 15% reduction in agency funding at a time when demand has only increased. We have been doing our best to respond by sharing best practices, creating resources that help election officials, and offering technical assistance where possible. In fact, this past month we held meetings with our advisory boards made up of election officials from across the country and other key stakeholders. We heard resounding enthusiasm for the EAC's work and the direction we are heading.

But the agency is nearing a point where funding cuts will impact what we can accomplish, and the support we can provide election officials, especially related to election security. My colleagues spoke about our election technology and field services team. They are doing amazing work but are a team of only 10 people. With over 8,000 election jurisdictions in the United States, there are limits to our capacity, but not our desire or commitment.

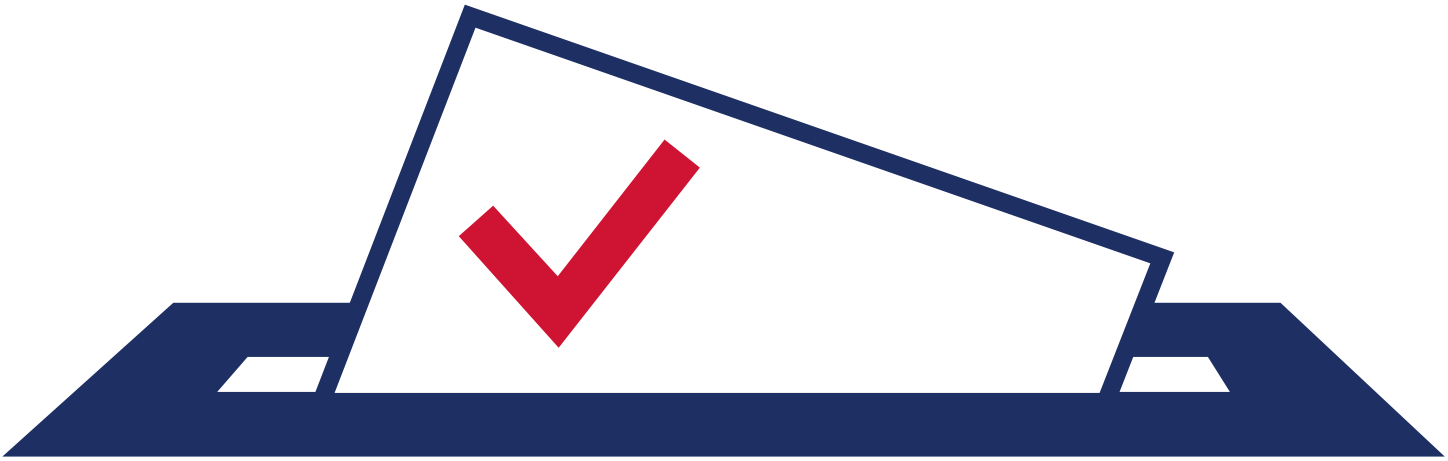
We continue to work creatively and thoughtfully to respond to election officials' needs. We are piloting a number of efforts, including those to enhance election security and technology, in a way that informs future programs and allows for rapid scaling if appropriate funding is provided. This is also part of why we designed the EAC's Learning Lab to release new content on a rolling basis and provide asynchronous trainings accessible to election officials anywhere in the country at no cost.

Additionally, one of the agency's most significant accomplishments was the development and adoption of the 2.0 version of the Voluntary Voting Systems Guidelines. There are now two systems certified to this standard and five more in the testing process. A report that we shared with Congress this week notes that much of the voting equipment in use is nearing the end of their recommended lifespans and conservatively estimates a cost of $2.7 billion for jurisdictions across the country to make this transition.

I mention this because we must consistently invest in our election administration infrastructure. Too often we are bailed out by the innovation and hard work of the public servants that run our elections. Many seasoned election officials have left the profession, taking with them valuable institutional knowledge. To fully meet the challenges of this moment and ensure our elections remain secure, there needs to be greater support for elections at the local, state, and federal levels.

We know this investment matters. Since 2018, states report using HAVA Security Grants to replace paperless voting systems, harden statewide voter registration databases, increase cybersecurity training, and enhance physical security. Many of these improvements to election security were made possible because of federal funding and Congressional support.

At the EAC, we are committed to continuing to do everything we can to ensure elections are safe, secure, accurate, and accessible. Thank you for the opportunity to testify about our work and the challenges facing election officials. I am happy to answer any questions you may have.



The Road to Widespread Deployment of Next Generation VVSG 2.0-Certified Voting Systems

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The U.S. Election Assistance Commission would like to thank William T. Adler and Theo Menon of the Bipartisan Policy Center for their contributions to the development of this report.

Executive Summary

The transition to next-generation voting systems that conform with the federal Voluntary Voting System Guidelines (VVSG) version 2.0 represents a critical opportunity to strengthen the security and accessibility of U.S. elections. VVSG 2.0, which was adopted by the U.S. Election Assistance Commission (EAC) in February 2021, establishes the most rigorous federal standards for certifying voting systems to date. More than five years later, two systems have been certified to VVSG 2.0, and multiple systems are in the pipeline.

Even after a voting system has been federally certified, deployment does not happen overnight. States first have to certify it, procure it, integrate it into existing systems, and train workers to use it. This report describes the path from VVSG version adoption to widespread deployment of certified systems and identifies obstacles in that path. It also analyzes the age of voting equipment across the country, projects how long it will take to replace this equipment and estimates how much replacement will cost.

Key Findings

- ✓ **Many states need to replace their voting equipment soon.** A significant portion of the nation's voting devices are approaching the end of their typical and recommended service lifespan. By the 2028 presidential election, the average age of voting equipment, if not replaced, will be about 9.3 years old. While 9 years may not sound old, aging voting systems face real risks: hardware becomes harder to source, software loses support, and maintenance grows more costly for both manufacturers and jurisdictions. Historically, jurisdictions have replaced voting equipment when it reaches about 9.7 years of service. Notably, some states have jurisdictions that continue to use equipment that is nearly 30 years old.

- ✓ **Certification, procurement, and deployment take years.** Federal and state certification processes are complex and time-consuming. Even after certification, procuring and deploying systems can present additional challenges.

- ✓ **Widespread replacement will be costly.** If all voting systems (including direct recording electronic machines, ballot marking devices, hand-fed optical scanners, and batch-fed optical scanners) were replaced in 2028 with VVSG 2.0-certified systems, the total cost would be roughly $2.71 billion, based on historical pricing and manufacturers' pricing projections. However, this price does not reflect the cost of all election technology required to run an election or the overall cost of conducting elections. All these costs are substantial and ongoing and should be factored into any long-term investment in the nation's election infrastructure.

- ✓ **Funding is the most important lever for change and advancement of technology.** Large-scale adoption of VVSG 2.0-certified systems will take longer in the absence of sustained, predictable federal investment to supplement local election budgets. Past bursts of the Help America Vote Act (HAVA) grant funding — after the 2000 presidential election and during the COVID-19 pandemic — spurred some equipment upgrades, but irregular and insufficient federal funding has made it difficult for state and local officials to plan replacements in sync with equipment life cycles. Consistent funding for the EAC and its Testing and Certification Program is also essential for ensuring that standards are periodically updated, and systems are certified in a timely and accurate manner.

- ✓ **State policymakers play an important partnership role in voting system upgrades.** State policymakers ultimately determine how voting system certification and procurement takes place; absent federal funding, state and local governments will have to bear the cost of procuring new systems.

✓ **Widespread deployment may be years away.** Based on historical replacement trends, more than half of voting equipment will be replaced between 2026 and 2032. However, the timing of replacement does not necessarily mean jurisdictions will replace that equipment with VVSG 2.0-certified systems, especially if federal funding is limited.

Introduction

Modern voting system technology is a key element of American election infrastructure. Although election officials have used computerized tabulation technology in some form for decades — going back to early punch-card scanners — contemporary voting systems perform far more functions than their predecessors. These systems help ensure that ballots are counted accurately and efficiently, facilitate unofficial results on election night, and enable strong post-election audits. They not only improve private and independent access for voters with disabilities but are necessary to help jurisdictions meet federal accessibility requirements.

They also address a challenge unique to the United States: the extraordinary complexity of its elections. Unlike most other democracies around the world, U.S. ballots often contain contests for federal, state, and local offices, as well as numerous ballot measures — all of which must be counted accurately, often across thousands of jurisdictions using different ballot styles. Computerized voting systems make it possible to manage this scale and complexity efficiently while reducing the risk of human error that can accompany manual counts.

Keeping voting systems up to date is essential not only for a smooth voting experience but also to guard against evolving security threats.

In a decentralized election system where states and localities choose, procure, and operate their own voting equipment, federal standards set a nationwide baseline for security, usability, accessibility, and reliability. Clear and testable standards give manufacturers a target to design toward and help election officials evaluate their options with confidence.

Congress recognized the value of establishing standards and certification by passing the Help America Vote Act of 2002 (HAVA). HAVA set minimum standards for all voting systems nationwide and established a framework for certifying voting systems to a more comprehensive set of guidelines. It created the Election Assistance Commission (EAC) and tasked it in part with developing and administering that certification framework. The core of this effort is the Voluntary Voting System Guidelines (VVSG). Since 2009, 81 voting systems have been certified as compliant with the VVSG and deployed across the country. VVSG 2.0 defines a voting system as:

> ***Equipment (including hardware, firmware, and software), materials, and documentation used to enact the following functions of an election:***
>
> 1. *Define elections and ballot styles.*
> 2. *Configure voting equipment.*
> 3. *Identify and validate voting equipment configurations.*
> 4. *Perform logic and accuracy tests.*
> 5. *Activate ballots for voters.*
> 6. *Record votes cast by voters.*
> 7. *Count votes.*
> 8. *Label ballots needing special treatment.*
> 9. *Generate reports.*
> 10. *Export election data including election results.*
> 11. *Archive election data.*
> 12. *Produce records in support of audits.*

The EAC adopted VVSG 2.0 in 2021. At the time of writing, the EAC has certified two systems under VVSG 2.0, and multiple systems are in the testing pipeline.

This report examines what motivates election officials to upgrade or replace their voting systems and the challenges they face in doing so. We estimate when voters are likely to be voting on these new systems and how much the transition will cost. To gather information for this report, we interviewed and surveyed state and local election officials, testing laboratories, and voting system manufacturers; analyzed publicly available documents and statements from events; and conducted quantitative analysis on publicly available data.

The Voluntary Voting System Guidelines

The EAC develops the Voluntary Voting System Guidelines with assistance from the Technical Guidelines Development Committee (TGDC). Although federal law does not require states[1] to use the VVSG or to only use systems that the EAC has certified as compliant with the VVSG, the guidelines shape the voting system landscape by providing a testable benchmark for voting system security, accessibility, and reliability.

Voting system manufacturers can voluntarily submit their systems for certification under the EAC's Testing & Certification Program, which relies on federally accredited private Voting System Test Laboratories (VSTLs) to assess whether a system meets the VVSG requirements. The process can take months or years, depending on the scope of the submission and the manufacturer's preparation, potentially requiring changes from manufacturers.

The VVSG has gone through several iterations in the decades since Congress passed the Help America Vote Act. From its adoption in 2005 through 2025, VVSG 1.0 was the only version to which any systems were certified.[2] VVSG 1.1 was adopted in 2015, but no systems were submitted to be certified to it. VVSG 2.0, adopted in 2021, represents the most significant revision and update to date. Compared with 1.0, 2.0 includes enhanced cyber and physical security features, upgraded usability and accessibility standards for persons with disabilities, enhanced ballot secrecy, and greater interoperability across different election technologies.

Although VVSG 2.0 was adopted in February of 2021, systems built to its specifications are still undergoing development and testing in preparation for certification. The first VSTL was accredited to test to the standard in December of 2022. The first VVSG 2.0 system application was submitted in February of 2023. The first system (Hart InterCivic's Verity Vanguard 1.0) was certified in July 2025, and a second system (Smartmatic's VSR1 2.1) was certified in November 2025. Five manufacturers (VotingWorks, Liberty Vote USA Inc., Hart InterCivic Inc., Election Systems & Software Inc. [ES&S], and Unisyn Voting Solutions) either have systems under test or have submitted an application to begin the testing process. As of publication, the EAC is receiving comment from the HAVA federal advisory committees to a draft VVSG 2.1.

States vary widely in how they use the Voluntary Voting System Guidelines. Some require full federal certification for all voting systems; others only require testing to the VVSG or by federally accredited laboratories. Some others do not incorporate any element of the EAC Testing & Certification Program into their state certification framework. As a result, the adoption and implementation of federally certified systems remain uneven across the country.

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[1] Throughout this report, the term "state" refers to the 50 U.S. states, the District of Columbia, and the five permanently inhabited U.S. territories (American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands).

[2] As recently as 2012 the EAC did, however, certify several systems to the 2002 Voting System Standards (the predecessor to the VVSG) promulgated by the Federal Election Commission

How are new systems developed, certified, and deployed?

Adopting a new version of the VVSG is only the first step in a lengthy process. Certification and deployment of compliant systems do not happen immediately. Instead, it takes years of system development, testing, and coordination across federal, state, and local levels before new systems reach voters.

Below, we outline the steps that must be completed after the EAC adopts a new version of the VVSG and before a jurisdiction deploys a system: system development, VSTL testing and federal certification, state certification, procurement, and training and deployment.

System development

After the VVSG is updated, the responsibility for developing compliant systems shifts to voting system manufacturers. Upon review of the new requirements, manufacturers may adapt existing platforms to meet them, or they might choose to build new systems from the ground up.

Manufacturers face different timelines for VVSG 2.0 submissions based on their product portfolios, customer commitments, and operational demands from states and localities. In some cases, smaller manufacturers may be able to focus more quickly on VVSG 2.0 submissions, while larger manufacturers may need to balance new certification work with support, maintenance, and other obligations of existing systems and customers. This dual focus on supporting current systems while investing in next-generation development can slow progress and lengthen development timelines.

As a result, the time between VVSG version adoption and submission to testing can vary significantly across manufacturers based on differences in capacity, business strategy, and existing obligations.

VSTL testing and federal certification

HAVA tasks the EAC with providing a process for the testing and certification of voting systems by accredited laboratories. The EAC details these processes in the Voting System Testing and Certification Program Manual, briefly summarized here.

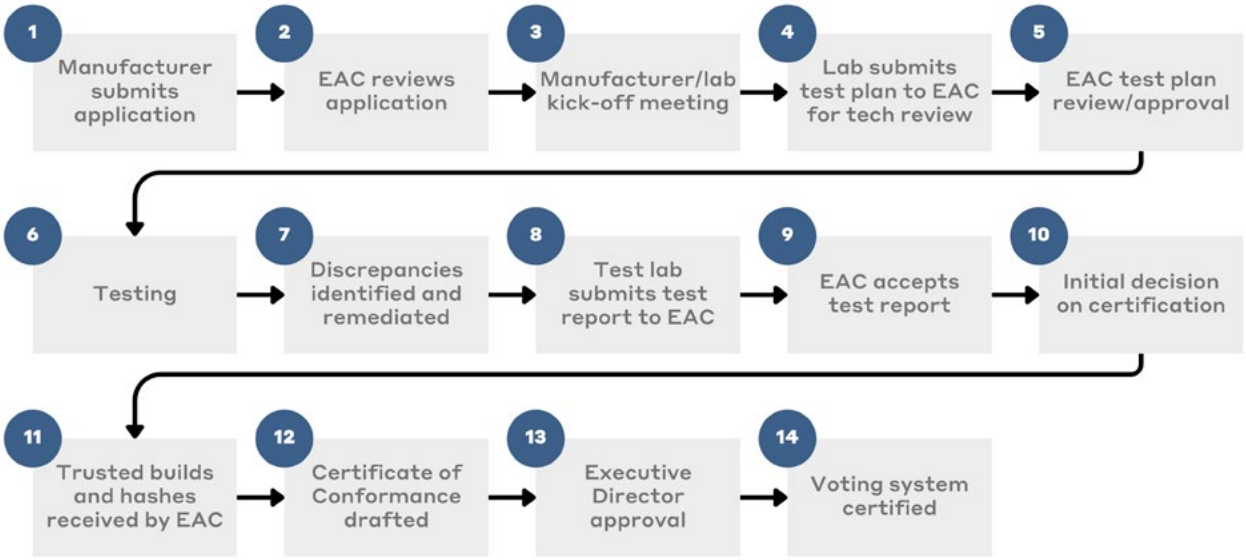
When a manufacturer is ready to begin the federal certification process, it submits an application to the EAC. Once the EAC reviews and approves the application, the manufacturer works with a federally accredited VSTL to develop a detailed test plan. The EAC then reviews and approves the plan before testing can proceed.

Testing is extensive. VSTLs evaluate the system's performance across a wide range of categories, including accessibility, accuracy, durability, software integrity, and security. According to one lab, SLI Compliance, a system may be assessed against about 1,200 VVSG requirements. Because these requirements can apply to multiple system components, a new certification campaign can involve 6,000-8,000 individual tests. In the case of Hart InterCivic's Verity Vanguard system, testing against VVSG 2.0 reportedly required more than 6,000 VSTL project hours (the cumulative number of hours that testing staff devoted to the work). Sources interviewed for this report suggest that manufacturers typically pay the labs about $1 million to test a new system for EAC certification.

Throughout the testing process, VSTLs or manufacturers may submit a Request for Interpretation (RFI) to the EAC for clarification on specific VVSG requirements. An RFI is a means by which manufacturers and VSTLs may request the EAC to provide a definitive interpretation of VVSG requirements, when in the course of developing

or testing a voting system, the meaning of a particular requirement is ambiguous. Resolving RFIs can be time consuming, but it is essential for completing testing or making adjustments to system features in line with the standards.

Figure 1. *The process for federal voting system testing and certification. Adapted from EAC.*



After testing is complete and all discrepancies have been remediated, the VSTL submits a test report to the EAC indicating that the system meets all requirements. The EAC then conducts a technical review to determine whether to approve the test report. If approved, the manufacturer provides a "trusted build," a secure, verified version of the voting system software compiled under controlled conditions. The trusted build is accompanied by a digital hash, or fingerprint, used to verify the software's integrity. The trusted build is retained by the EAC and serves primarily to create a documented chain of evidence that allows stakeholders to have an approved model to use for verification of a certified voting system.

Once these steps are complete, the EAC issues a Certificate of Conformance indicating that a system has received federal certification.

It often takes several years for these first two steps (system development and VSTL testing and federal certification) to be completed. In July 2025, more than four years after VVSG 2.0 was adopted, the first voting system (Hart InterCivic's Verity Vanguard) was certified to meet the new requirements. This timeline is on par with VVSG 1.0, which was adopted in 2005: The first system was certified just over three years later. However, testing and certification for future systems is expected to take less time as requirements are made more clear to the VSTLs and manufacturers, in part through the RFI process.

State certification

Almost every state has laws, regulations, and policies governing the process by which the state certifies voting equipment for procurement and use in its jurisdictions. Some states require full EAC certification before a system can be state-certified. Others only require testing by a VSTL, so theoretically the state certification process can begin before the system is EAC certified. In one state that requires VSTL testing to state standards (rather than to the VVSG), a state official said that, practically speaking, a manufacturer cannot come to the state

without being federally certified first. This underscores the foundational role of VVSG certification even in states where VVSG is not a required prerequisite.

State certification can be a lengthy process. It may involve in-state testing that goes beyond VVSG requirements, opportunities for public input, and additional statutory or regulatory steps. These procedures influence the pace and feasibility of transitioning to systems certified to VVSG 2.0.

In some states, the chief election official may certify multiple systems, allowing localities to choose from a set of certified voting systems. In Texas, for example, manufacturers may apply to have their systems considered for state certification. In addition to requiring federal certification, Texas employs its own detailed inspection process. Systems are subjected to physical review by an independent panel of examiners. Examiners also question the manufacturers about functionality, security, and legal compliance. The examiners then issue written reports summarizing the testing results and recommending whether the system can be certified as compliant with Texas law. After the testing process, the state holds public hearings before the secretary of state issues a certification or not. To date, the secretary of state has never overruled the panel's recommendation.

In other states, the process is more centralized, with the state certifying only one system to be used statewide. In Maryland, the State Board of Elections is required by law to select and certify a single voting system to be deployed statewide. It solicited proposals in 2014 from system manufacturers and evaluated these proposals with input from local boards. Ultimately, it selected a system, issuing a certification report detailing how the system is compliant with each element of state law.

States often charge manufacturers a modest fee to cover the cost of testing. For example, in Texas, manufacturers pay $3,000 per voting system component, such as a scanner or ballot marking device (BMD). Such fees are typically required regardless of whether the system is ultimately certified. Some states like North Carolina require manufacturers to post a bond or letter of credit to cover "damages resulting from defects in the voting system," such as "any costs of conducting a new election attributable to those defects."

These costs and timelines are not limited to initial certification. Updates and modifications, such as engineering change orders (ECOs), require additional review and testing, and larger changes that result in new system versions are treated as new submissions for certification. Because state certification processes can vary so much (according to one manufacturer, "no state does it the same way,") certification may take weeks or months.

Procurement

Once a voting system has received state certification (if required), manufacturers can begin selling their systems to jurisdictions. But how these procurements are made — and who pays for them — varies significantly from state to state.

In some states, the state government handles procurement directly. These states negotiate contracts and pricing with manufacturers at the state level. This centralized approach allows the state to standardize equipment, control costs, and ease the administrative burden on counties. But even in this case, there is variance in terms of who pays. For example, in Georgia, the state pays the entire cost of the voting system. But other states may split costs. Even in Maryland, where a single system is certified and procured, counties are statutorily required to pay 50% of the cost.

In other states, procurement is left largely or entirely to counties or municipalities. Even when the state manages certification or testing, local officials are responsible for selecting, funding, and purchasing systems, often from a list of state-certified options. Some states establish a permanent funding stream to help jurisdictions pay election-related costs, including equipment. Minnesota, for example, has a voting operations, technology, and election resources (VOTER) account that the secretary of state distributes to counties based on the number of

registered voters. Occasionally, states or the federal government will offer one-time funding opportunities, typically in response to security concerns or broader system modernization goals. Such funding may also carry reporting and other administrative requirements for jurisdictions.

Regardless of which level of government provides the funding, these resources ultimately come through public appropriations at the state, local, or federal level.

Training and deployment

Once a new system is certified and procured, it still cannot be safely deployed until election officials and workers are trained to operate it. The cost and complexity of the training vary depending on state and local factors and on how different the new equipment is from existing systems. Several state officials interviewed for this report indicated that training would require additional time and resources that are scarce in smaller and less well-resourced jurisdictions. Officials also emphasized the importance of integrating new systems well in advance of elections to give local officials ample time to train their teams.

In addition to training election officials and poll workers, jurisdictions may also need to invest in voter education and public outreach before deploying new systems. These efforts can include public demonstrations, educational materials, outreach events, and staff time to ensure voters receive accurate information about how to use the new equipment and the reason for replacement. The cost and complexity of voter education vary based on the size of the jurisdiction, whether the rollout is statewide or local, and how different the new system is from the one voters previously used.

What is the state of voting equipment in the U.S.?

Election officials we interviewed generally reported that the voting systems currently deployed across the United States are serving them and their voters well; however, in some jurisdictions, the equipment is approaching or past its typical lifespan. Aging equipment can be more difficult to maintain, more expensive to repair, and less secure against physical and cyberattacks. To ensure that elections continue to be secure, trustworthy, and accessible, jurisdictions recognize the need to update their software and hardware to the newest versions but also recognize that aging hardware and legacy systems will ultimately require replacement.

Voting equipment is, on average, approaching the end of its lifespan.

Most American voting equipment[3] is now approaching the end of its typical and recommended lifespan. Unless widespread replacement occurs, voting system equipment in use for the 2028 presidential election will average about 9.3 years old — nearly as old as it has ever been since 2006, which was the second highest average in available data.[4] The highest average age came in 2018, when Americans voted on equipment averaging 10.3 years old.

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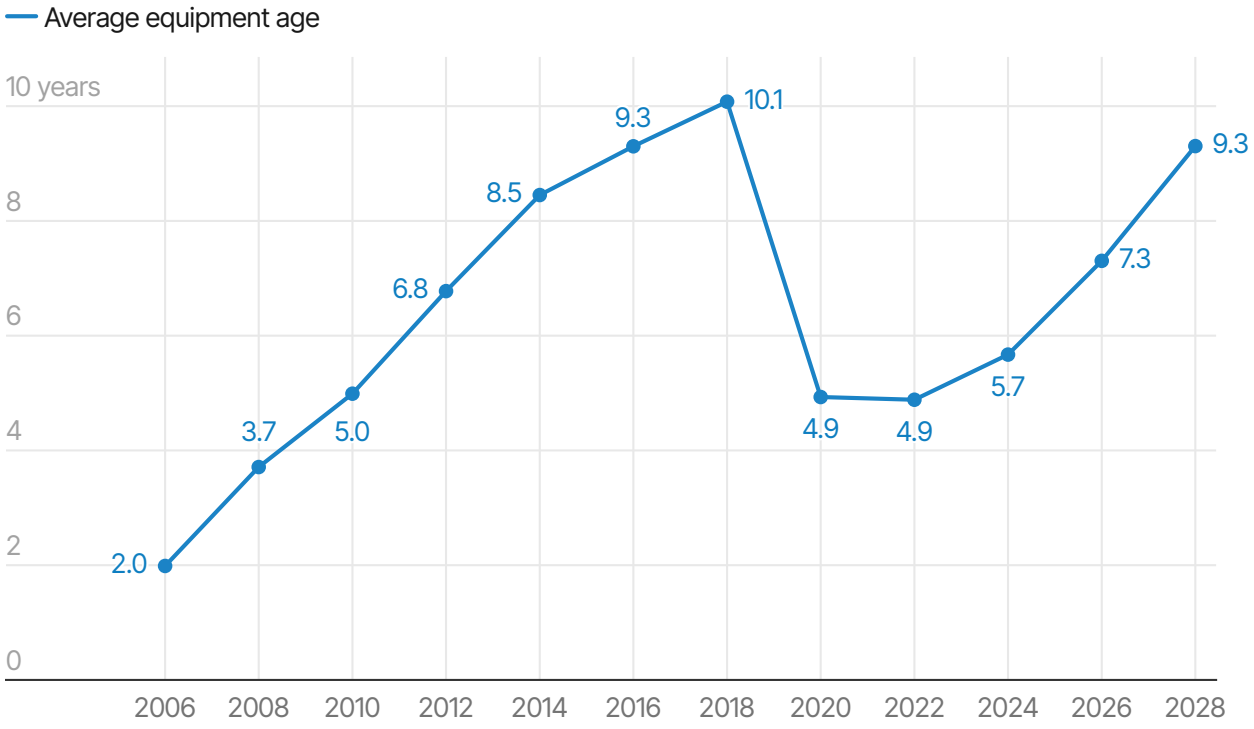
[3] In this report, our quantitative analyses of voting equipment include four categories of devices: ballot marking devices, direct recording electronic machines, hand-fed optical scanners (sometimes called precinct-count scanners), and batch-fed optical scanners (sometimes called central-count scanners). Equipment in these categories is within the scope of the VVSG. Data on usage of equipment in these categories is available in both Verified Voting's Verifier dataset and in the EAVS, where jurisdictions report how many devices they deploy for use during a given general election.

[4] These estimates are based on Verified Voting data, which reflects available information about which systems will be in use in 2026. However, some jurisdictions may plan to procure new systems before 2026, and the data might not reflect this.

Figure 2. In 2028, voting equipment will be nearly as old as at any point since 2006.

The average age of modern voting equipment reached a peak in 2018. It dropped sharply in 2020, mostly because of the acquisition of new ballot marking devices. It has been steadily rising since 2020.



Average equipment age is weighted by the estimated number of devices (ballot marking devices, optical scanners, and direct recording electronic machines) in use.

Source: *U.S. Election Assistance Commission, Verified Voting*

It is important to note that the age of the nationwide inventory varies depending on the equipment type. For instance, in 2028, ballot marking devices (BMDs) and batch-fed optical scanners will be 8.2 and 8.7 years old, respectively.[5] In contrast, the average direct recording electronic machine (DRE) will be 18 years old, with some deployed machines reaching 30 years old.

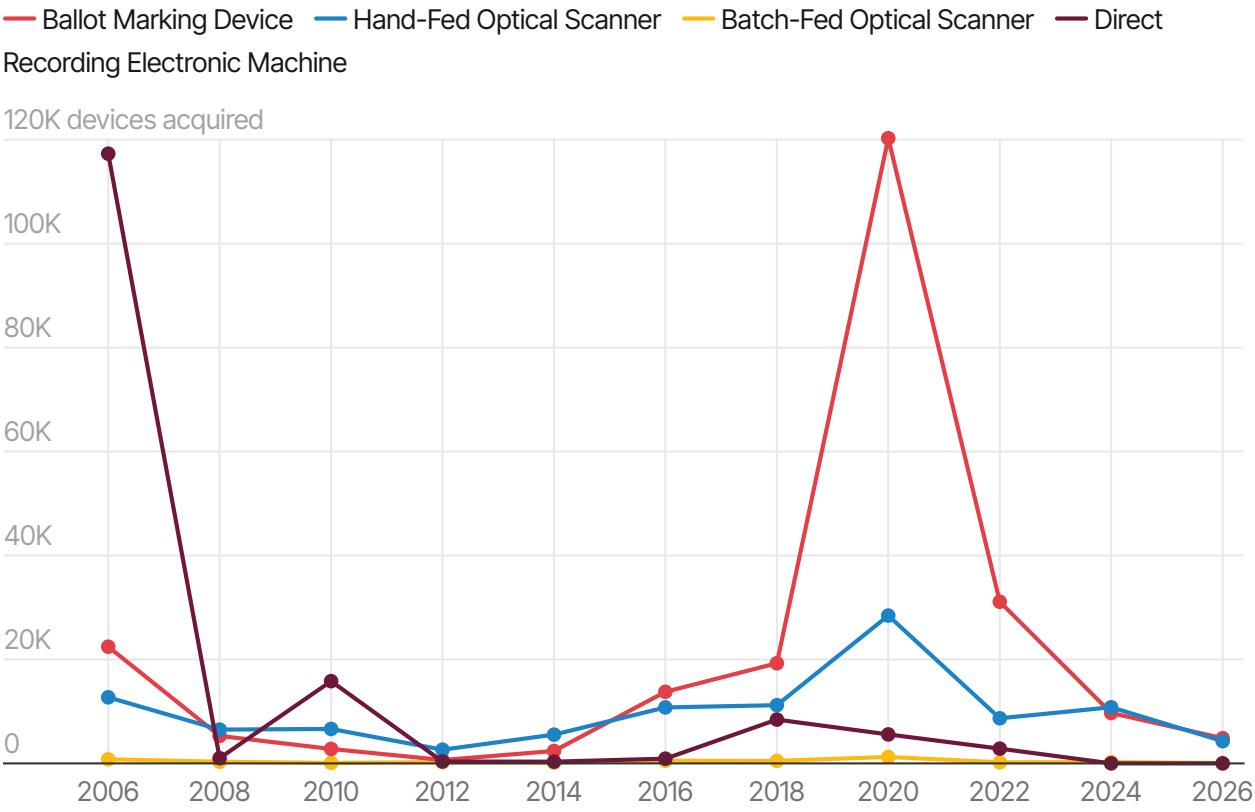
The age of equipment is a result of historical voting equipment purchasing trends. In the years immediately after Congress passed HAVA in 2002, election officials were provided with $3.65 billion in federal funding. The legislation did not require funding to be spent on voting systems, but much of the money was used to procure new DREs, BMDs, and hand-fed optical scanners. After that infusion of funding, officials generally deferred purchasing new equipment until 2014-2016, when they began to procure new hand-fed optical scanners and BMDs. From 2018-2020, Congress authorized $1.205 billion in additional HAVA funds, which corresponded with more equipment acquisitions, including batch-fed optical scanners to aid with the rise of mail-in ballots,

[5] In 2020, Georgia, South Carolina, and several large counties began to use BMDs for all in-person voters on Election Day (i.e., they became "BMD-for-all" jurisdictions). Accordingly, the number of voters living in BMD-for-all jurisdictions went from 1.6% to 17.7%. Unrelatedly, jurisdictions also acquired batch-fed optical scanners to accommodate the COVID-19-related increase in mail-in ballots.

and widespread replacement of paperless DREs.[6] Since then, acquisitions of new equipment have markedly decreased, and inventory overall is aging.

Figure 3. New equipment acquisitions have slowed.

After a wave of new equipment acquisitions from 2018-2022, acquisitions have slowed in recent years. This trend may reflect the timing of VVSG 2.0 adoption and implementation, as many jurisdictions and manufacturers may have expected VVSG 2.0-certified systems to become available and delayed some purchasing decisions during the transition period.



Equipment acquisitions are estimated based on the per-capita number of devices reported by jurisdictions in the 2024 EAVS, and historical data from Verified Voting.

Source: *U.S. Election Assistance Commission, Verified Voting*

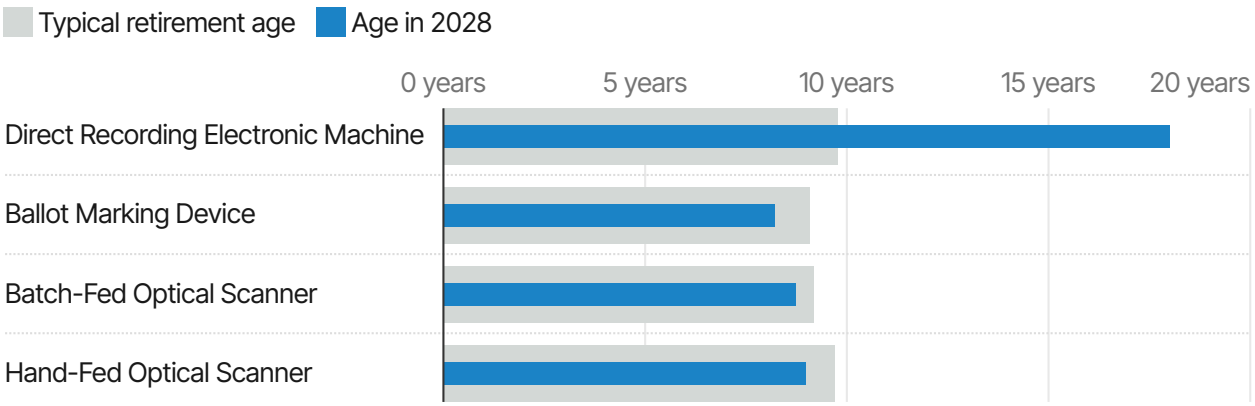
Manufacturers typically describe their equipment as having a life expectancy of about 10 years, and in interviews, election officials generally said they plan on replacing equipment every 10-15 years. (Several officials said they hope to use their current system until it is about 20 years old.) In practice, equipment is

[6] This most recent wave of acquisitions also may have corresponded with the end of life of many of the systems acquired immediately after HAVA was passed. It is not easy to disentangle the impacts of system end of life, new federal funds, and COVID-19 on new equipment acquisitions.

replaced slightly more often than that: Since 2003, equipment (excluding outdated lever and punch-card voting systems, which are no longer used) has been retired on average after 9.7 years. However, the average retirement age varies depending on equipment type. In 2028, optical scanners (both hand-fed and batch-fed) and BMDs will be within one year of their average retirement age, and DREs are already well beyond their average retirement age.

Figure 4. Voting equipment is approaching its typical retirement age.

In 2028, direct recording electronic machines in use will be on average 8.3 years past their typical retirement age. Ballot marking devices and ballot scanners will be within one year of their typical retirement age.



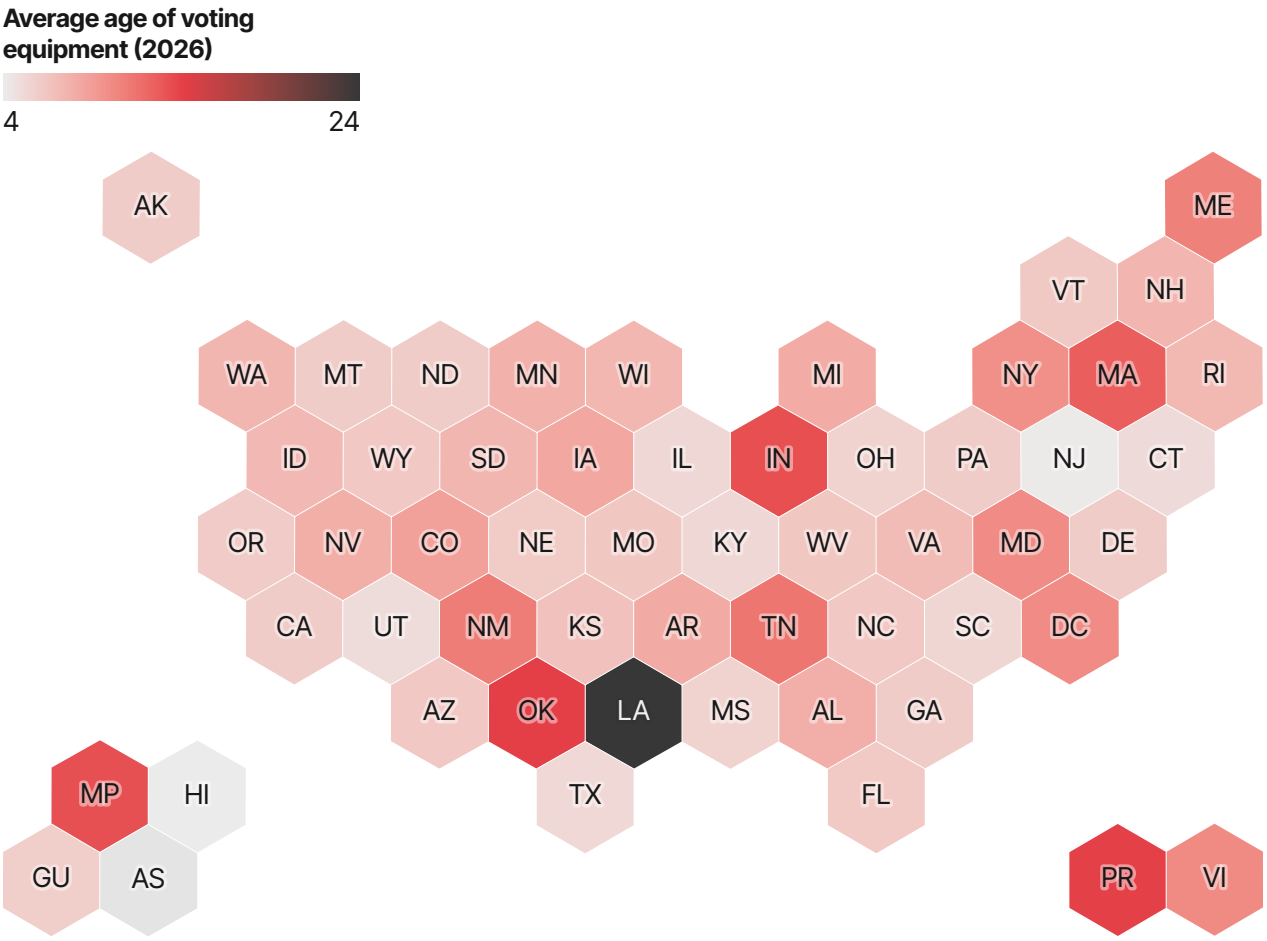
Average equipment ages are weighed by the estimated number of devices in use.

Source: *U.S. Election Assistance Commission, Verified Voting*

The age of voting equipment varies across states.

In 2026, the average age of voting equipment by state will vary from about four years in Hawaii, Mississippi, and South Carolina to about 14 years in Oklahoma, Puerto Rico, Louisiana, and Massachusetts. This, too, varies by equipment type, as some states have a mix of old and new equipment. For instance, some Tennessee counties in 2026 will use DREs that are about 20 years old as well as BMDs that are only about five years old.

Figure 5. The age of voting equipment varies across states.



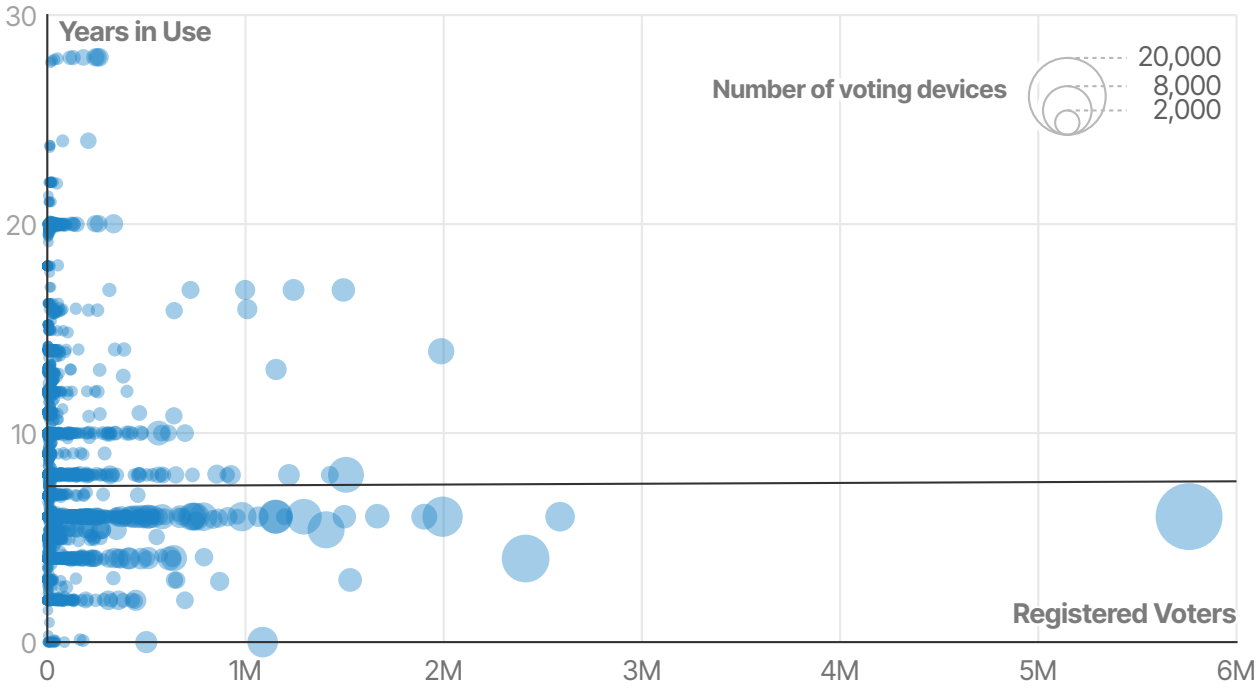
Map data: Tilegrams/NPR

Source: *U.S. Election Assistance Commission, Verified Voting*

Although equipment age varies across states and jurisdictions, it is not easy to predict this variation. For example, one might expect that larger (and often better-resourced) jurisdictions would tend to replace equipment more frequently and therefore have newer equipment in 2026. But this is not the case: The number of registered voters in a jurisdiction is not a good predictor of average equipment age.

Figure 6. Larger jurisdictions do not have newer equipment, on average.

Each point represents one jurisdiction in the national dataset. The trend line shows only a weak relationship between jurisdiction size and age of equipment.



Source: *U.S. Election Assistance Commission, Verified Voting*

What motivates officials to adopt new voting systems?

Even though the nation's voting equipment inventory is diverse, consisting of both old and new systems, many jurisdictions are due for equipment replacements. Officials are indeed interested in upgrading or replacing their systems: In a recent survey of local election officials, which asked what they would invest in if their budget grew, voting equipment topped the list, tied with hiring poll workers.

Which voting system to adopt and when to adopt it is a complex and high-stakes decision for any election jurisdiction. A jurisdiction may use a system for a decade or more, so officials take great care to make sure that a new system meets their needs.

Aging equipment inventory

The primary motivating factor for replacing voting systems is equipment age. Manufacturers and election officials generally assess the lifespan of the average voting system to be about 10 to 15 years. As described above, equipment is typically replaced after 9.7 years on average.

As equipment ages, it becomes more prone to malfunction, more difficult to repair, and less likely to have the latest functionality. This year, Louisiana Secretary of State Nancy Landry said that "it's impossible to find parts" for the state's old voting equipment. Officials we interviewed expressed interest in replacing their equipment long before the point where repair becomes difficult. Some officials pointed to specific equipment components

like battery backup, saying that when battery backups expire, it may be prudent to buy new equipment rather than new batteries for aging equipment due to costs and ability to find replacements.

One official reported that in their state, older scanners were more likely to jam and have other issues that could cause them to be down temporarily. They described this equipment as "mission critical," indicating that many counties in their state needed to replace equipment soon. They said that some of these election officials with aging equipment were eyeing 2.0-certified systems as possible replacements, if such systems were to be certified and available whenever the jurisdiction had funding and was ready to replace their aging equipment.

Voter confidence

For some officials, one of the main reasons to upgrade or replace their equipment is to improve public perception and voter confidence. Even though these benefits can be partly achieved by purchasing a new system certified to VVSG 1.0, officials generally agreed that a 2.0-certified system would further improve voter confidence. One state official reported that local officials are not interested in replacing their systems with new systems certified to the previous version of the VVSG. Instead, with a 2.0-certified system, officials can credibly tell voters that their elections are being conducted with the newest and most secure technology.

One report notes that voter confidence is "based in part on their own experiences with the electoral process and election administration," and is only weakly related to policy (such as voting equipment choices). Indeed, some officials reported to us that new equipment may in fact reduce trust among voters who have grown used to using a particular kind of equipment. But one official explained that public confidence in elections was shaken following an election-related error several years previously. To the extent that outdated equipment is causing errors (or is visibly slow or malfunctioning), upgrading to more reliable equipment may improve trust.

Upgraded accessibility, security, and auditability features

A 2018 Government Accountability Office (GAO) survey of election jurisdictions found that overall performance, accessibility, physical security, and cybersecurity were the most important voting equipment features for respondents.

VVSG 2.0 enhances the requirements for these categories, but officials interviewed and surveyed for this report varied widely in their familiarity with the content of VVSG 2.0. This variation appeared across both state and local officials. A few officials who were familiar with the requirements in VVSG 2.0 highlighted some of the new principles and specifications that seemed most valuable to them. One official said that the auditability improvements were "pretty huge." Another said that the improvements to accessibility would be welcome. Multiple officials said that the new requirements that voting systems use common data formats could be beneficial, either by making it easier for their systems to interoperate or by simplifying results reporting.

However, most officials were only vaguely familiar with the requirements in VVSG 2.0. At the time the interviews were conducted, no VVSG 2.0-certified system was on the market. Some of the officials interviewed believed they would learn more about the system once more certified systems became available. According to one manufacturer, there is a general feeling among election officials that the new guidelines are good and, when informed of the details, they like what they hear, but added that local officials tend to be more focused on their immediate needs.

State certification laws

As described above, most states have a process for certifying voting systems for use. For some states, state certification requires that voting systems be tested to the VVSG[7] or certified by the EAC to conform to the VVSG.

A few states go further, requiring that voting systems be tested under or EAC certified to meet the *most recent* VVSG version. In these states, state certification statutes may be a significant factor driving adoption of VVSG 2.0 systems, because the state is effectively barred from certifying any new systems that are not 2.0-certified. But even in these states, it may be a long time before 2.0-certified systems are certified at the state level or deployed for use because state approval, funding, procurement, and implementation all take time.

What are the challenges to widespread adoption of VVSG 2.0-certified systems?

Despite the above factors that motivate state and local election officials to upgrade or replace their voting systems, several major challenges must be overcome before 2.0-certified systems are deployed widely.

Increased and uncertain costs

Election officials are deeply cost-conscious when they make decisions about equipment. Among election officials interviewed and surveyed for this report, cost was the most frequently cited barrier to adopting 2.0-certified systems. One statewide election official noted that local officials need to answer voter questions about equipment "every day," and that numerous county election officials would replace their systems if financial considerations were not a factor.

Adopting new voting systems has always been an expensive undertaking, and while 2.0-certified systems promise security and usability improvements, they are also estimated to be more expensive than previous systems. Most state officials interviewed supported updating their voting systems to 2.0-certified systems, but all acknowledged the sobering financial realities of replacing systems.

Meanwhile, manufacturers reported some uncertainty about how they will price their products, in part because of fluctuating component costs and how this could affect the industry in the coming years. One manufacturer noted that sourcing parts is already difficult, so increased costs alone would likely not be enough to force a change in suppliers. Another said they would try to absorb cost increases rather than pass them on to jurisdictions, but it is unclear if all manufacturers will adopt the same approach.

State legislation adds another layer of uncertainty. Some lawmakers have proposed requiring that all voting system components be manufactured in the United States. Manufacturers reported increasing attempts to source U.S.-produced parts based on supply chain security concerns to comply with potential state laws or potential federal regulations, but they stressed that achieving fully U.S.-manufactured systems would be extremely challenging, if not impossible.

[7] Some states require testing to the VVSG or testing by VSTLs to state guidelines, but do not require EAC certification.

Episodic and unpredictable federal funding

State and local budgets are often insufficient for supporting the large-scale replacement of voting equipment.[8] Federal funds have played a crucial role, but appropriations have been episodic and unpredictable. This lack of sustained investment makes it hard for jurisdictions to plan for long-term system replacements, because they do not know if or when additional support will arrive. The GAO survey of election jurisdictions found that in some places, a lack of HAVA funding delayed equipment replacement or made it so they were unable to acquire new equipment that would meet their needs.

Voting equipment replacements have often followed influxes of federal funding. The first modern wave of voting system acquisitions came in the wake of HAVA, which allocated billions of dollars for states to replace antiquated machines that were problematic in the 2000 election. Another wave of equipment replacements (see Figure 3) roughly coincided with increased federal funding for elections in the form of HAVA Election Security Grants, of which over $138 million were spent on voting equipment between 2020 and 2023. The CARES Act, passed during the pandemic, included $400 million to help election officials respond to COVID; some officials used these funds to buy batch-fed ballot scanners to aid in processing the influx of mail-in ballots. However, because these funds are typically allocated across the entire country, the amount available to any one state or jurisdiction is often not enough to support full equipment replacement.

Election officials have long stressed the importance of consistent, ongoing investment in election infrastructure — not just during high-profile moments like the aftermath of the 2000 election or a global pandemic. A consistent federal funding stream would enable jurisdictions to upgrade or replace their systems earlier and in accordance with equipment life cycles.

There appears to be an industry trend toward spreading the cost of voting systems over time through leasing or amortized payment plans rather than paying the full cost up front, and a consistent federal funding stream would also support jurisdictions that go this route.

Lengthy state certification processes

As described above, every state maintains its own regulatory and technical review process governing the use of voting systems. Many states require their own independent certification or technical review process before they certify a system for usage in their jurisdictions, and this review may include additional requirements not covered at the federal level. Several state officials interviewed for this report described their certification processes as lengthy, sometimes adding months or even a year to the overall timeline for deployment.

State requirements that may be misaligned with VVSG 2.0

In some states, laws specifically reference outdated federal standards, such as VVSG 1.0 (2005), VVSG 1.1 (2015), or even the Voting System Standards (the VVSG predecessor) adopted by the Federal Election Commission. Because these older versions may include requirements that conflict directly with those in VVSG 2.0, such statutes could effectively prohibit the use of newer, 2.0-certified systems.

Other states may not require specified versions of standards but still impose statutory requirements that are incompatible with VVSG 2.0. These legal constraints can also present obstacles to adoption of 2.0-certified systems.

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[8] Local jurisdictions generally pay these costs. A 2018 GAO survey of election jurisdictions found that jurisdictions with 79% of the population nationwide use local funds to pay part of the cost of new voting equipment. Only 11 states indicated that they cover all costs for acquiring new equipment.

In certain cases, election officials may be able to work around these obstacles, including through administrative interpretation. However, in states where election law is interpreted very narrowly or applied very strictly, state legislators may need to take action to ensure that jurisdictions can adopt the most modern, secure, and accessible voting systems.

Small manufacturer pool

At the time of publication, only two manufacturers (Hart InterCivic and Smartmatic) have completed certification to VVSG 2.0. The limited pool of available manufacturers restricts procurement options for election officials across the country. This challenge is exacerbated when jurisdictions are reluctant to switch manufacturers; officials cited training demands, familiarity with existing systems, long-standing relationships, and the ability to get a deal when trading in old equipment to the same manufacturer.

Even if a system receives federal certification, the manufacturer's interest and capacity may also be an obstacle to pursuing sales. From the manufacturer's perspective, entering a new market (whether state or local) can be time-consuming and may not be a priority compared with servicing existing clients. State certification is a costly and time-consuming process, and even once state certified, expanding into new local markets may not be worth it. One state official described an attempt to expand a manufacturer's presence in their state but said that the manufacturer only appeared interested in servicing the largest county.

Procurement

Even after systems are certified and funding is secured, procurement remains a barrier to expedient system replacements. Government procurement is notoriously complex, requiring officials to navigate public bidding requirements, state regulations, and local approval processes. These hurdles can slow or derail upgrades to voting systems.

Louisiana, for example, has been attempting for years to replace its now decades-old voting equipment. The state selected a manufacturer through a bidding process in 2018, but the governor voided the contract after "the state's chief procurement officer [said] the secretary of state's office mishandled the bid process, not following legal requirements." A 2021 state law then created a new requirement that systems be assessed for compliance with a set of certification standards before bidding, further delaying procurement. At the time of writing seven years later, the state is now conducting public testing of six voting systems from manufacturers who intend to bid for the contract.

Public speculation further complicates the already lengthy procurement process as well; voting system manufacturers have been a frequent target of public scrutiny since 2020, making it difficult for election offices to select a voting system that satisfies the varied interests of stakeholder groups. Even after procurement, voting systems often continue to be the target of litigation.

When will VVSG 2.0-certified systems be widely deployed?

Now that two systems have been certified to VVSG 2.0 and other systems are being tested, it is reasonable to ask: *When will we see the widespread deployment of 2.0-certified systems? When will election officials and voters begin to see the security and usability benefits?*

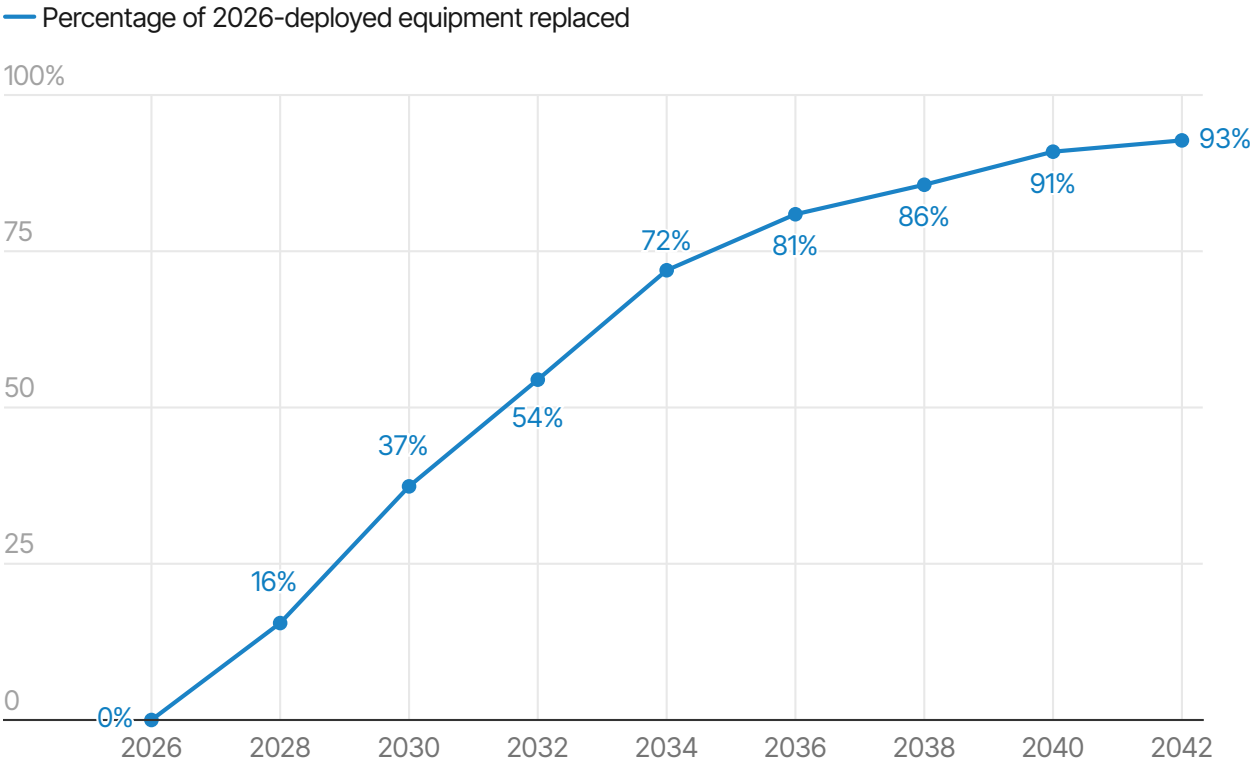
As discussed above, deployment does not immediately follow federal certification. Instead, a number of factors affect purchasing decisions and timelines, most significantly the age of existing equipment and the availability of funding.

At the National Association of State Election Directors (NASED) Winter Conference in February 2025, the American Council for Election Technology (ACET), a trade association representing voting system manufacturers, projected that "several" systems would be certified by 2027, with "full scale, nationwide deployment and use in elections" beginning around 2029. In this section, we expand on that industry estimate by examining historical replacement patterns and forecasting when VVSG 2.0-certified systems are likely to be widely deployed.

More than half of voting equipment will be replaced by 2032, but not all replacements will be 2.0-certified.

One important factor influencing deployment timelines is the age of existing equipment in the field. Officials feel pressure to replace aging systems, which may be costly to maintain or not have modern security, accessibility, and usability features. We analyzed historical patterns of equipment retirement and replacement. By applying those patterns to the current landscape (see Methods), and by projecting forward from the systems expected to be in use in 2026, we conducted a simulation to estimate when jurisdictions are likely to retire their current equipment and acquire new ones.

Figure 7. More than half of voting equipment in use in 2026 will be replaced by 2032.



Forecasted equipment replacement rates are based on historical patterns, which may not reflect future trends.

Source: *U.S. Election Assistance Commission, Verified Voting*

This simulation accounts for the age of each piece of currently deployed voting equipment and estimates the likelihood that it will be replaced in coming years. It shows that about 16% of the voting equipment inventory

is likely to be replaced by the 2028 presidential election, about 37% will be replaced by the 2030 midterm election, and the majority (over 54%) will be replaced by 2032.

It is not clear, however, that these replacements will be with 2.0-certified equipment. Not all manufacturers have yet submitted systems for testing to VVSG 2.0. These manufacturers (and even the manufacturers who have submitted or had systems certified) will continue to sell and support their 1.0-certified systems. Some jurisdictions replacing their systems may want to stay with their current manufacturer, which may not yet sell a 2.0-certified system (see above, *Small manufacturer pool*).

Some other factors might cause equipment to be replaced on a slower timeline than we forecast here. First, the forecast assumes that historical replacement trends will continue. But equipment deployed in the last 10 years or so may prove more reliable, potentially leading jurisdictions to keep it in service for longer. Second, funding may be more of an obstacle than it has been in the past. As of the date of publication, ACET estimates that VVSG 2.0 systems are expected to cost 20%-50% more than previous generations. State and local funding might not be enough to enable widespread replacement.

On the other hand, some jurisdictions have delayed replacement until 2.0-certified systems became available. If so, there may be pent-up demand for 2.0-certified systems, leading replacement to happen faster than projected; however, interviews with election officials do not suggest that this would be a widespread trend.

This forecast provides a data-driven baseline estimate for when we might expect large-scale replacement of currently deployed, mostly VVSG 1.0-certified voting equipment. The likelihood of system replacements in the coming years presents an opportunity: Jurisdictions may be in a position to choose VVSG 2.0-certified systems and gain the associated benefits. Whether they ultimately do so will depend on the availability of state and federally-certified systems, funding levels, and other challenges described above.

How much will it cost to deploy VVSG 2.0-certified systems nationwide?

Despite the challenges that must be overcome before VVSG 2.0-certified systems are adopted on a large scale, we can forecast what it would cost for VVSG 2.0-certified equipment to be purchased by every jurisdiction nationwide.

Replacing all voting equipment with VVSG 2.0-certified equipment in 2028 would cost about $2.71 billion.

We estimate that if every jurisdiction were to replace all their BMDs, hand-fed ballot scanners, batch-fed ballot scanners, and DREs with VVSG 2.0-certified equipment in 2028, it would cost $2.71 billion.

Table 1. Voting equipment cost

Estimate of the cost of purchasing new VVSG 2.0-certified BMD's, hand-fed scanners, and batch-fed scanners across the U.S.

Jurisdiction type	Jurisdictions	Registered voters	BMDs (cost)	Hand-fed scanners (cost)	Batch-fed scanners (cost)	Total cost
BMD/DRE-for-all jurisdictions	838	71.98M	$1.08B	$264.19M	$66.18M	$1.41B
HMPB+BMD jurisdictions	5.62K	163.09M	$455.73M	$639.58M	$208.86M	$1.3B
Total	**6.46K**	**235.07M**	**$1.53B**	**$903.77M**	**$275.04M**	**$2.71B**

BMD/DRE-for-all jurisdictions are jurisdictions that currently use BMDs or DREs for all in-person voting on Election Day.

Source: *U.S. Election Assistance Commission, Verified Voting*

We determined the number of pieces of equipment that would need replacement by using the equipment reported in the 2024 release of the Election Administration and Voting Survey, the EAC's biennial survey of election officials. To estimate the cost of each piece of equipment, we used the results of an informal survey of its members that ACET conducted.

Finally, we computed our total cost estimates by multiplying the number of pieces of equipment by the per-unit cost estimates (see Methods for more detail).

To our knowledge, this is the first time that the cost of replacing all voting equipment with VVSG 2.0-certified equipment has been estimated. But the number is compatible with previous estimates of the cost of replacing some subsets of voting equipment. A 2022 MIT report estimated that it would cost between $1 billion and $3 billion to buy new equipment.[9]

Our estimate is also plausible in light of previous public contracts. For example, Georgia's 2019 contract for a new statewide system cost $107 million (or $146 million in projected 2028 dollars)[10]; we estimate that new BMDs and scanners in 2028 would cost the state $182 million.

Our estimate carries several important caveats:

- ✓ For simplicity's sake, we estimate the cost of replacement as if it were to occur all at once in 2028, but this is unlikely to reflect how replacement will happen in practice. Not all jurisdictions will replace their equipment at once; those jurisdictions with older equipment (and sufficient available funding) will likely replace their equipment first. Moreover, the jurisdictions that replace their equipment may spread the cost over several years through a lease or a multiyear purchase agreement. A more detailed analysis could combine

[9] A 2024 Brennan Center analysis looked at the cost of replacing smaller subsets of devices: $203 million to replace devices first fielded in 2014 or earlier; or $150 million to replace devices that are no longer being manufactured.
[10] Note that this amount appears to include contracted costs for scanners, BMDs, electronic pollbooks, an election management system, training, and 10 years of license fees. An alternative figure for comparison could be the initial outlay of $69 million (or $94 million in projected 2028 dollars) for BMDs and scanners.

these cost estimates with a model of likely equipment replacement (along the lines of what we provided in the section above), producing an annual appropriations profile to guide funding decisions.

- ✓ Our estimate is based on the current number of registered voters and deployed devices. It does not account for potential population growth that could increase the number of devices needed in the future.
- ✓ The per-unit cost estimates we rely on reflect the upfront cost of BMDs and scanners only. They do not include hardware and software costs related to election management systems or electronic pollbooks. Nor do they include annual fees related to service, maintenance, training, or software licensing, which might be paid to a manufacturer as part of a voting system replacement.
- ✓ Our estimate assumes the replacement of every BMD, DRE, or scanner currently deployed. However, some newer currently deployed voting system components may only require minor updates to bring them into compliance with 2.0. Achieving 2.0 compliance should be cheaper and easier for jurisdictions with these newer components.
- ✓ The per-unit cost estimates are derived from current equipment pricing and adjusted using manufacturer estimates of expected VVSG 2.0 cost increases.

Additionally, it is important not to mistake our estimate for a comprehensive accounting of what it costs to run elections, or even all the costs associated with acquiring and using new equipment. Our estimate does not include, for example:

- ✓ Other election technology, such as election management systems, electronic poll books, or ballot-on-demand printers
- ✓ Operational expenses for deploying, storing, and maintaining equipment
- ✓ Annual fees paid to voting system manufacturers for support, maintenance, and software licensing and maintenance (which, over the lifespan of a voting system, may match or exceed the cost of the initial acquisition)
- ✓ Labor for programming devices, training poll workers, troubleshooting problems, or educating voters on how to use new systems, or
- ✓ Future price increases related to market conditions, tariffs, supply chain disruptions, or sourcing changes.

All these costs are substantial and must be factored into any long-term investment in the nation's election infrastructure.

Congress should consider providing sustained funding for voting system upgrades and replacements to supplement local and state support.

The transition to VVSG 2.0-certified systems would be accelerated if Congress made sufficient federal funds available to support the cost of voting system replacements. Local and state governments bear the vast majority of ongoing election administration costs, but many officials interviewed for this report stated that past rounds of federal funding made it possible to replace aging devices, given high upfront costs.

[11] Election Systems & Software (ES&S) has indicated that some of its equipment is "VVSG 2.0-compatible" (even though it has not yet been certified) and that therefore customers will "not necessarily" need to purchase an entirely new system to achieve 2.0 compliance.

But federal support has been episodic. Since the passage of the Help America Vote Act in 2002, federal funding for election equipment has come in unpredictable waves, leaving states and local jurisdictions uncertain about if or when they can count on outside support.

The move to VVSG 2.0-certified systems represents a generational shift in voting technology, one that brings with it both new security protections and implementation costs. If Congress intends for this next generation of systems to be widely adopted, it should consider making federal funding available on a long-term basis, allowing state and local governments to plan ahead. A sustained, flexible approach to funding would help ensure that no part of the country is left behind: Jurisdictions with older inventory could replace systems sooner, while those with newer inventory or slower certification and procurement processes could transition over a longer timeline, and states and localities could better plan phased replacements around the amount and timing of allocations.

Consistent funding for the EAC is also essential for ensuring that systems are certified in a timely and accurate manner, and that funds are delivered to states for purchasing them. The Testing and Certification Program requires resources to operate effectively. Moreover, if Congress provides new grants for voting system upgrades and replacements, the EAC will be responsible for administering those funds, a task that requires its own staffing and operational capacity. Without stable funding for these functions, even well-funded jurisdictions could face delays in obtaining certified systems.

Conclusion

The transition to VVSG 2.0-certified voting systems is one of the most important modernization efforts in U.S. election infrastructure in the coming decade. As detailed in this report, VVSG 2.0 sets a higher bar for security, accessibility, and auditability. Even though a few systems have been certified to VVSG 2.0 and more are in the pipeline, the path from certification to nationwide deployment remains long and complex.

The findings above point to a clear reality: Voting systems are at or nearing their expected lifespan, and many jurisdictions are considering or will soon consider replacement systems. The choices made now — by manufacturers, state and local officials, and Congress — will determine whether VVSG 2.0-certified systems will be broadly in place by the end of the decade, or whether jurisdictions will continue relying on legacy systems.

An infusion of federal money could accelerate the transition to VVSG 2.0-certified systems, but sustained and predictable federal investment would go even further to support American elections. Previous rounds of federal funding have enabled system replacements, but this model of episodic appropriations leaves jurisdictions unable to plan or budget for system replacements in sync with equipment life cycles. A reliable funding stream would allow officials to plan upgrades and replacements as needed and train staff well ahead of deployment.

Although the road to widespread deployment remains complex, clear federal leadership can help election officials transition to 2.0-certified systems in a way that strengthens the resilience, security, and accessibility of elections for years to come.

Methods

Quantitative analyses

All code and data for quantitative analyses are available on GitHub.

Current equipment age and typical retirement age

To analyze the age and typical retirement age of voting equipment, we used two datasets: historical voting equipment data collected in the Verified Voting Verifier (downloaded on September 15, 2025), and voting equipment counts reported by election officials in the 2024 Election Administration and Voting Survey, the EAC's biennial survey of election officials. The datasets complement each other: The Verifier has clean historical data but no equipment quantities, and EAVS has some information on equipment quantities.

The Verifier dataset includes, for every nationwide federal election year since 2006, a description of the make and model of various categories of election equipment (e.g., ballot marking device or hand-fed optical scanner) for every election jurisdiction. It also indicates the first year that the equipment was in use, allowing us to analyze the age of the devices, as well as the typical age at retirement.[12] It also indicates the "Election Day Marking Method" for a particular jurisdiction and year, which has a large impact on equipment counts (e.g., a jurisdiction that uses BMDs for all voters has far more BMDs per voter than a jurisdiction that uses hand-marked paper ballots for most voters).

We restricted our analysis to equipment types that are both quantified in EAVS and typically included as components in voting systems submitted for certification to the VVSG (i.e., we included BMDs, optical scanners, and DREs and excluded electronic poll books).

To determine the age of a piece of equipment when it was retired, we grouped the dataset by jurisdiction and equipment model. We flagged the last year in which each unique equipment model was observed — excluding 2026, the most recent year in the data — as the equipment's final year in use. This approach assumes that if a model was, for a given jurisdiction, observed and then not observed, it was retired.

When calculating overall average equipment age, we weighted equipment age by the estimated number of devices in a given jurisdiction. To estimate the number of devices, we used the 2024 release of EAVS to determine the average number of voters per device. These rates were applied to jurisdictions in Verified Voting's dataset going back to 2006, based on each jurisdiction's Election Day Marking Method and number of registered voters, each year. The following section details how we used the 2024 EAVS data to estimate the number of voters per device.

Estimating number of voters per device

Among other data, EAVS includes jurisdiction-level information on the quantity and model of various types of election equipment deployed in the 2024 general election. However, this data is not reported by all jurisdictions, and some jurisdictions do not report it in a complete fashion. To account for this, we filtered the dataset to the jurisdictions that reported the most complete and generalizable data and, using that data, generalized to the other jurisdictions going back to 2006. We followed this procedure:

- ✓ We applied two filters to the dataset. These filters reduced the dataset to 3,617 of the 6,461 jurisdictions (56%) reporting to EAVS, representing 194.8 million of 235.1 million (82.9%) registered voters.
    - ✓ **Filter 1**: We excluded jurisdictions if they said they used a particular kind of equipment but did not report how many pieces of equipment they had. To be more specific, EAVS questions F3-F6 ask officials if they have DRE machines without a voter-verified paper audit trail (VVPAT), DRE machines

[12] It is possible that in some cases this data slightly overestimates equipment age. A jurisdiction may replace old equipment with new equipment of the same model; the "first year in use" data may still refer to the year that the model was first used, even though the equipment itself may be new.

with VVPAT, BMDs, or scanners. If, for example, a jurisdiction said they had BMDs but did not report quantity for at least one particular model, we excluded that row from the dataset because we could not get a complete picture of that jurisdiction's equipment inventory. This excluded 2,443 jurisdictions, representing 35.3 million voters total.

- ✓ **Filter 2**: We excluded jurisdictions that reported having no equipment. This excluded an additional 401 jurisdictions, representing 4.9 million voters total.

- ✓ For each jurisdiction, we added up the number of pieces of equipment in four categories: DREs with VVPAT, DREs without VVPAT, hand-fed scanners, and batch-fed scanners. Because hand-fed and batch-fed scanners are reported as a single category in EAVS, we manually identified which scanner models are hand-fed or batch-fed.

- ✓ We split the jurisdictions based on the Election Day Marking Method as determined by Verified Voting (e.g., "Hand-marked paper ballots and BMDs," "BMDs for all voters," "DREs with VVPAT for all voters," etc.). We determined, separately for each category, the number of pieces of equipment per registered voter.[13] This information can be seen below.

Table 2. Number of registered voters per device, by election day marking method

For jurisdictions that use assistive devices (BMDs or DREs) for all voters, the number of voters per device is similar, between 319 and 381. Likewise, for jurisdictions that use hand-fed scanners for all voters (i.e., jurisdictions that use "Hand-marked paper ballots and BMDs" or "BMDs for all voters"), the number of voters per scanner is similar, at about 2 thousand.

Election day marking method	BMD	Hand-fed scanner	Batch-fed scanner	DRE with VVPAT	DRE without VVPAT
Hand-marked paper ballots and BMDs	2K	2K	83K	451K	758K
BMDs for all voters	381	2K	117K	28K	85K
DREs with VVPAT for all voters	49K	124K	147K	370	-
DREs without VVPAT for all voters	-	612K	-	-	319
Hand-marked paper ballots; Direct recording assistive interface without VVPAT for accessibility	-	1K	611K	-	-

Only includes "Election day marking method" categories that consist of at least 50 jurisdictions after data pre-processing.

Source: *U.S. Election Assistance Commission, Verified Voting*

[13] Because North Dakota has no voter registration, and therefore zero registered voters in EAVS, we used the number of eligible voters per county as reported by the North Dakota secretary of state.

Equipment replacement timeline forecast

To forecast future equipment replacement, we used survival analysis techniques. Survival analysis is well suited for analyzing data where the event of interest has not yet occurred for all observations. In medical research, the event of interest may be patient death; in our case, the event of interest is equipment retirement. While most of the Verified Voting dataset (which goes back to 2006) consists of equipment that was retired before 2026, a substantial portion (45%) is still expected to be in use in 2026. For these cases, the date of equipment retirement is unknown, making this dataset suitable for survival analysis techniques.

To estimate the likelihood of equipment retirement over time, we initially fit a Cox proportional-hazards model using equipment type and the number of registered voters as covariates. The goal was to assess whether these factors were systematically associated with earlier or later retirement. However, we found no statistically significant relationship between these predictors and the hazard of retirement. As a result, we did not use them to forecast equipment replacement.

Instead, we used a non-parametric approach and fit a Kaplan-Meier estimator for all equipment types combined, weighted by the number of devices. This estimator gives us the survival curve — that is, the probability that equipment remains in use — for each year of age. From the survival curve, we derived the hazard function, which captures the conditional probability that a piece of equipment is retired and replaced in a given year, given that it has been in use up to that point. We then ran a forward simulation starting from the set of equipment expected to be deployed in 2026, using the hazard function to probabilistically determine whether devices would be retired and replaced in each future nationwide federal election year.

Equipment replacement cost estimate

To determine the cost of deploying VVSG 2.0-certified systems nationwide, we estimated (a) the number and type of voting device required to be purchased, and (b) how much it would cost to replace each device with a VVSG 2.0-certified equivalent. To compute our total cost estimates, we multiplied the estimated number of devices by the per-device cost estimates.

Estimating the number of devices to purchase

To estimate the number and type of voting equipment required to be purchased, we used a similar procedure as above to estimate the number of devices used per registered voter. However, the aim this time was not to estimate the historical number of devices used by jurisdictions, but the number of devices jurisdictions will use when using a 2.0-certified system. Because of the paper trail requirements in VVSG 2.0, it is expected that there will be no jurisdictions that use DREs for all in-person voting (i.e., "DRE-for-all" jurisdictions). The equipment inventory in these jurisdictions will not be reflective of the inventory that a jurisdiction using a 2.0-certified system will have. (More specifically, DRE-for-all jurisdictions use far fewer hand-fed optical scanners; see Table 2 above.) To account for this, we added a third filter to the two filters described in the above "Estimating number of voters per device" section:

- ✓ **Filter 3**: We excluded jurisdictions that Verified Voting identifies as a jurisdiction that uses DREs for all in-person voters on Election Day. This excluded an additional 190 jurisdictions, representing 11.3 million voters total.

With this additional filter, the dataset included 3,427 of the 6,461 jurisdictions (53%) reporting to EAVS, representing 183.5 million of 235.1 million (78.1%) registered voters.

We split those jurisdictions based on whether Verified Voting identifies them as using BMDs for all in-person voters on Election Day (i.e., "BMD-for-all" jurisdictions). Of the 3,427 jurisdictions, 539 fall into this category

and 2,888 do not. Separately for BMD-for-all jurisdictions and other jurisdictions, we used the reported number of registered voters to determine the average number of DREs, BMDs, hand-fed scanners, and batch-fed scanners per registered voter. (These rates are similar to those in Table 2.)

Having determined the average per-voter number of BMDs, DREs, and scanners, we now imputed the data in the 3034 jurisdictions that we originally filtered out, using the number of registered voters in those jurisdictions. We treated DRE-for-all jurisdictions as BMD-for-all jurisdictions (using the assumption that DRE-for-all jurisdictions will become BMD-for-all jurisdictions when they move to VVSG 2.0-certified systems). We then treated all DREs as if they were BMDs (using the assumption that DREs in non-DRE-for-all jurisdictions will be replaced with a similar number of BMDs).

The above procedure provided, for every jurisdiction, an estimate of the number of hand-fed scanners, batch-fed scanners, and BMDs that will need to be purchased in a wholesale system replacement. The estimate accounts for the number of registered voters and whether a jurisdiction is BMD-for-all or DRE-for-all.

Estimating the cost of VVSG 2.0-certified devices

To estimate the cost of replacing each scanner and BMD, we first consulted "The Price of Voting" (2021) by Matthew Caulfield, Andrew Coopersmith, et al., which analyzed pricing information sourced from hundreds of election equipment contracts; the report is the most comprehensive source of information on the cost of deployed systems. Appendix B includes, for a variety of equipment models, the median price, and the number of devices included in the contracts they analyzed. We manually categorized each model as a hand-fed scanner, batch-fed scanner, DRE, or BMD. For each category, we computed a weighted average of the median prices, using the number of devices included in the contracts. We checked these numbers against contracts available on the internet and contracts provided to us by election officials that we surveyed.

Replacement equipment is likely to cost more than these historical estimates. To estimate these costs, we contacted the American Council for Election Technology (ACET), a trade association representing voting system manufacturers. ACET conducted an informal survey of its members, directing them toward the historical pricing estimates published in Caulfield, Coopersmith, et al. (2021), and requested that members estimate how much more they expected 2.0-certified models to cost. ACET members indicated that they expected hand-fed and batch-fed scanners to cost 20%-30% more, and BMDs to cost 35%-50% more. We took the average of each cost increase range and multiplied it by the 2021 costs in Caulfield, Coopersmith, et al. We used that result as our estimate of the cost of voting equipment in 2026, roughly when manufacturers expect to start selling their 2.0-certified equipment.

We then took these manufacturer's 2026 cost estimates and estimated the cost in 2028 by using inflation projections from the Congressional Budget Office.

Table 3. Historical and projected voting equipment costs

Mean of median equipment prices identified by Caufield, Coopersmith, et al. (2021), and projected equipment prices for 2028.

Equipment Type	Average cost (2021)	Projected cost (2028)
BMD	$3,665	$5,598
Hand-fed scanner	$5,611	$7,517
Batch-fed scanner	$80,157	$107,388

Mean of median equipment prices identified by Caufield, Coopersmith, et al. (2021), and projected equipment prices for 2028.

Source: *Caufield, Coopersmith, et al. (2021), with cost increase estimates from the American Council for Election Technology and inflation projections from the Congressional Budget Office*

Qualitative information

To better understand the process — and challenges — of designing, testing, certifying, and deploying new voting systems, we received information from subject-matter experts, state and local election officials, and representatives of voting system manufacturers and test labs.

We collected information by reaching out to specific contacts via email, members of the BPC Task Force on Elections, contacts of the EAC Field Services team, and in-person contacts. In some cases, participants responded to a set of questions by email, or they completed a survey. In other cases, we held virtual or in-person interviews. Interviews were semi-structured, working from a set of predefined questions (which we sent ahead of time upon request) but diverging to cover particular subjects of interest and expertise in greater depth.

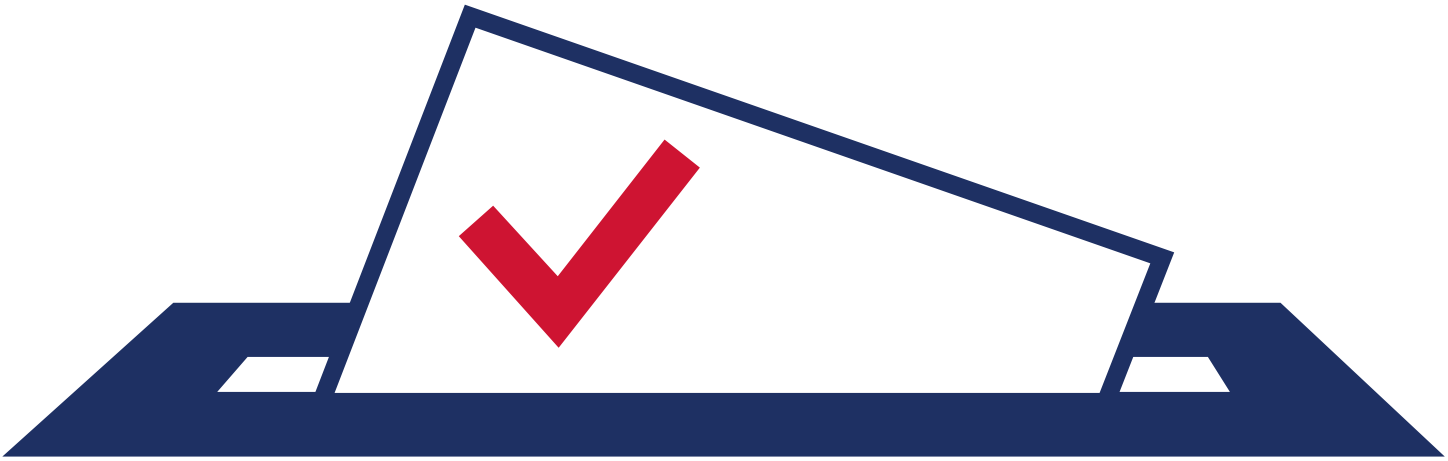
Interviews were conducted both before and after the signing of the "Preserving and Protecting the Integrity of American Elections" executive order on March 25, 2025, which may have affected sources' answers and assessments.

State and local election official interview participants were selected to reflect a diverse cross-section of states, considering election system certification and procurement processes, election authority structures, and population.

For the most part, interviewees were offered anonymity to encourage candor. Assessments made in this report are sometimes derived from interviews and sometimes from public information.

Acknowledgments

We thank everyone who provided their insights via interview or survey. For helpful comments and conversations, we also thank Megan Maier and Warren Stewart of Verified Voting and Matthew Caulfield of the Gabelli School of Business at Fordham University.



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Measuring the Impact of Recent Grants to Election Administrators Under the Help America Vote Act

REPORT TO THE U.S. ELECTION ASSISTANCE COMMISSION

December 2024

U.S. ELECTION ASSISTANCE COMMISSION

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Executive Summary

The U.S. Election Assistance Commission (EAC) was created by Congress in 2002 to improve the administration of elections for federal offices through funding, guidance, and policy development under the Help America Vote Act of 2002 (HAVA). Through HAVA, Congress provides funding to state and local election jurisdictions to enhance their operations. Since 2018, the EAC has disbursed over $1 billion in Election Security Grants, constituting one-fifth of all federal spending on election administration to date. This report represents the first comprehensive effort to categorize and catalog the impact of federal election funding since 2018.

As of August 2024, states reported spending over

$638 million

(approximately 63%) of the more than $1 billion in appropriated Election Security funds. Of the remaining funds to be spent, the vast majority (more than 98%) has been budgeted for planned activities.[1]

States have spent approximately

$343 million

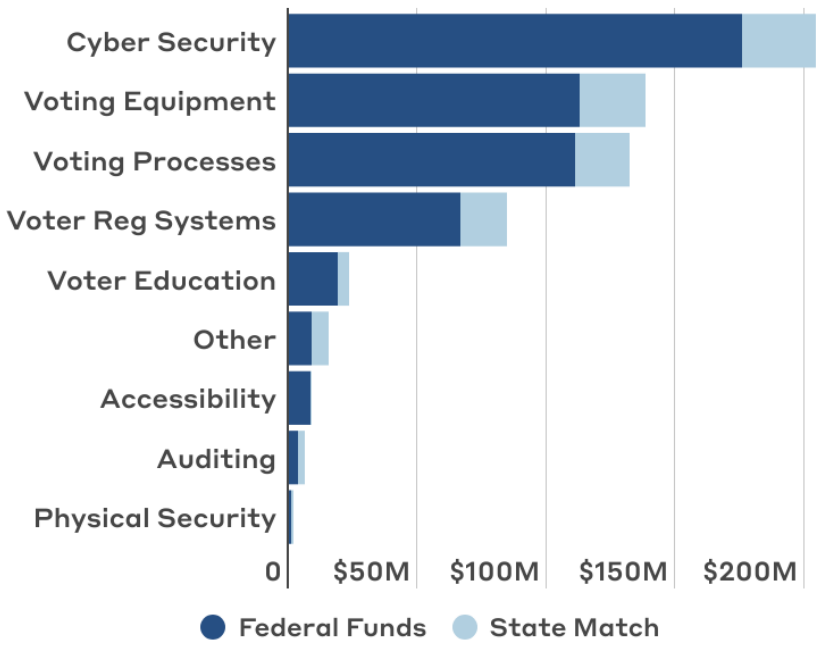
(about 56% of the Election Security funds that have been spent) on voting equipment and cyber security—expenditures that are necessary to keep elections safe, secure, and trustworthy.

To understand how funding has been deployed thus far, we gathered and analyzed grant reports, program narratives, and other documents provided by states[2] as part of the reporting process for federal Election Security Grants. We also conducted interviews with and reviewed additional materials from state and local election officials to provide a holistic assessment of the effects of Election Security Grants on election administration and the voting experience.

1 Calculated using cumulative budgets submitted by grantees with fiscal year 2024 Election Security funding applications.

2 Throughout this document, "states" refers to the 50 states, the District of Columbia, and five U.S. territories (American Samoa, the Commonwealth of Puerto Rico, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands).

Funds Spent by Category, 2020-2023



We find that the Election Security program is a key pillar of support for elections infrastructure. Since 2018, Election Security Grants have enabled election officials to perform essential functions, such as:

- protecting IT systems from foreign and domestic cyberattacks;
- ensuring that election officials can continue operations in case of a cyberattack;
- making sure voting systems are new and up to date;
- improving the accuracy of voter rolls;
- demonstrating to their voters how elections are run and kept secure;
- making sure polling places are accessible to all Americans;
- protecting the integrity of voted ballots;
- auditing their elections to ensure that proper procedures were followed and that outcomes were correct.

Election officials interviewed for this report agreed that HAVA funding helps ensure that they have the resources they need to run elections safely and securely. But some election officials noted that providing increased funding to election officials at predictable intervals would enable them to provide even better service to their voters, plan for long-term investments, and keep election equipment up to date and secure.

Introduction

Free and fair elections are the cornerstone of representative government. Since 2000, the process of administering elections has undergone rapid transformation, driven by technological modernization and increased public interest. Federal elections have more national security implications than in the past. These changes have placed additional strains on the local offices and officials tasked with ensuring the smooth and secure conduct of elections.

Federal funding to support election administration has been critical in providing election offices with the necessary resources to adapt to these changes. Federal grants have eased financial strains and provided opportunities for jurisdictions that would not have been able to afford vital equipment or process investments otherwise.

To better understand the impact of federal election funding, the U.S. Election Assistance Commission (EAC) partnered with the Bipartisan Policy Center and Fors Marsh to perform a mixed-methods research project exploring how federal Election Security Grants disbursed by the EAC between 2018-2023 have affected the administration of elections.[3] Election Security Grants were first appropriated through the Consolidated Appropriations Act of 2018 and subsequently made available through the Consolidated Appropriations Acts of 2020, 2022, 2023, and 2024. Over $1 billion in Election Security Grants have been disbursed to the 50 states, five territories, and the District of Columbia, constituting one-fifth of all federal spending on election administration to date.

This report represents the first comprehensive effort to catalog the effects of post-2018 federal election funding at the ground level. To that end, we compiled and analyzed grant reports, program narratives, and other documents provided by states as part of the reporting process related to federal Election Security Grants. We then supplemented those quantitative analyses with interviews with state and local election officials to understand the impact of Election Security Grants on election administration and the voting experience.

This study finds that Election Security Grants have facilitated significant improvements in voter accessibility, poll worker training, communication with constituents, physical security, and cyber security. Every election official we

3 The EAC is an independent, bipartisan commission whose mission is to help election officials improve the administration of elections and help Americans participate in the voting process. The Help America Vote Act of 2002 (HAVA) created mandatory minimum standards for states and provided funding to help states meet these new standards, replace voting systems, and improve election administration. HAVA established the EAC to assist states' compliance with new requirements, and to distribute federal funds authorized by the law to states.

spoke to unequivocally stated the importance of federal funding in enabling them to make improvements that otherwise might not have been possible. The findings make clear that ongoing federal investment is essential for the continuous improvement and security of election administration, particularly as elections face evolving cyber security threats and challenges related to artificial intelligence.

Scope, Data, and Methods

Since HAVA's inception in 2002, Congress has allocated $5.005 billion to aid and improve election administration, of which over $1 billion was allocated through Election Security Grants.

Although federal laws exist on voting rights, voter registration, and other administrative requirements, the power and responsibility of administering elections falls largely to states and their respective subdivisions—counties, parishes, boroughs, and municipalities. The decentralized nature of election administration means that financial responsibilities and funding mechanisms can vary significantly from one jurisdiction to another. Generally speaking, however, elections are funded primarily by local governments, with some funding needs augmented by state and federal support. This report focuses on the impact of federal funding for local election administration, specifically through HAVA authorized Election Security Grants. It does not examine the ability for state and local entities to independently fund elections or the efficacy of state and local funding.

SCOPE

History of Federal Election Funding

Federal election funds that are authorized through HAVA or must be spent in accordance with HAVA are referred to as "HAVA funds." HAVA funds are distributed through several types of grants. The largest of those grant programs are:

1. Section 101 and 102 Grants: $650 million in election improvement grants were authorized in 2002 under HAVA Sections 101 and 102 to help states comply with new HAVA requirements and to make other improvements to election administration. Section 102 funds were allocated specifically to cover the replacement of punch card and lever voting systems; this grant is no longer available. As of September 30, 2023, 46 states had expended all their Section 101 grant funds, and five additional states had expended 80% or more of their Section 101 funds. All Section 102 funds were expended more than a decade ago.

2. **Section 251 Requirements Payments**: $3 billion in requirements payments were authorized under HAVA Section 251 to help states meet the requirements of Title III of HAVA, which includes provisions on voting system standards (both mandatory and voluntary), provisional voting, and voter information. These payments help ensure that voting systems meet federal standards, provide for provisional voting, implement computerized statewide voter registration lists, and offer voting information at polling places. States must certify compliance with Title III to use these funds for broader election administration improvements. These grants are still available and help states maintain compliance with federal election standards. As of September 30, 2023, 37 states had expended all their Section 251 grant funds, and 13 had expended between 80% and 100% of these funds.
3. **CARES Act Grants**: $400 million in emergency funds were made available in 2020 under the CARES Act to assist states in managing the challenges posed by the COVID-19 pandemic during the 2020 election cycle. This was a one-time allocation, and these funds are no longer available.
4. **Election Security Grants**: $1.01 billion in Election Security Grants have been authorized since 2018 through the Consolidated Appropriations Acts of 2018 ($380 million), 2020 ($425 million), 2022 ($75 million), 2023 ($75 million), and 2024 ($55 million). (Congress did not authorize Election Security Grant funding in 2019 or 2021; see Figure 1.) These grants, which fall under HAVA Section 101, focus on enhancing the security of election systems, including cyber security and physical security improvements; upgrading voting equipment and technology; training election officials and poll workers; and improving voter registration systems. The grants require states to match funds, with a 5% match required for the 2018 grant funds and a 20% match for the 2020, 2022, 2023, and 2024 grant funds. As of September 30, 2023, two states had fully expended their Election Security Grant funds and nine had spent 80% or more of their Election Security funds through the 2023 allocation.

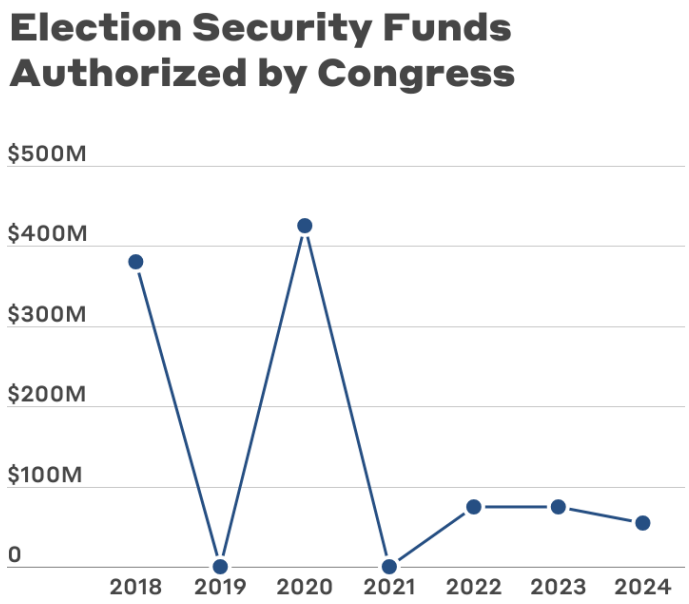


Figure 1. Election Security Funds authorized by Congress from 2018-2024.

Focus on HAVA Election Security Grants

The approximately $5 billion in allocated HAVA funds includes contributions from the four general grant types listed above. However, our report specifically focuses on Election Security Grants authorized from 2018-2023, as this grant program is the main active HAVA funding program that continues to issue federal funds to states.[4] A total of $947,546,202 was awarded to states as Election Security Grants from 2018-2023.[5]

DATA

The research team used files made available by the EAC to explore how states have expended these funds over time. These files consist mostly of forms submitted by states to obtain the funds, reports by states detailing their plans to spend the funds, and grant management software reports with data about actual Election Security Grant expenditures. The following are the main documents used for the analysis in this report:

4 Section 102 grant funds are no longer available. Section 101 and 251 grant funds have been exhausted by most states, and no new funds are being issued for those programs. The CARES Act grants were a one-time allocation and are no longer available.

5 This amount was obtained using FY2023 Federal Financial Reports from states. Arizona did not have a Federal Financial Report on record for 2023, thus its 2022 report was used to calculate the total.

- **Federal Financial Reports (FFRs)**: The EAC requires all states to submit a financial report using a customized FFR form unique to the agency. This form covers the cumulative federal funds granted by the EAC under the Election Security program to the state and the cumulative amount expended by the state (e.g., the FFR report for 2022 shows the amount granted to the state from the beginning of the program in 2018 until 2022 and the amount expended by the state since 2018 until 2022). This form also provides cumulative information on interest earned and interest expenditures. Although states complete FFRs quarterly or semiannually, this report only uses annual FFRs for ease of interpretation.
- **Program Narratives**: To access the funds, states are asked to provide a budget and a program narrative detailing how they plan to spend the Election Security Grant funds. Program narratives are nonstandardized text documents (unlike forms like FFRs), and they vary in length and organization from state to state. They can range from a couple of paragraphs to several pages and be organized in bullet points or in full-text paragraphs. These narratives lay out states' plans to spend their available Election Security Grant funds for the upcoming two years, and states complete them every year new funding is appropriated. States can later modify their program narratives; therefore, the program narrative may not be a faithful representation of how funds were actually spent. Rather, the program narrative represents a point-in-time view of how states intend to spend the appropriated funding.
- **Progress Reports**: These reports combine both open-ended and close-ended items. Progress reports allow states to discuss the grant activities and expenditures for the current reporting period in narrative form, and to indicate the amount of funds expended in each of the main grant categories in the reporting period. States complete this form semiannually; however, this report only uses annual progress reports for ease of interpretation.

The three types of forms discussed above have been modified by the EAC over time (e.g., addition of new expenditure categories in progress reports), and their completeness and availability also varied by state and year. However, a new grant management system implemented by the EAC in late 2023, the Grants Lifecycle Application System (GLAS), allowed the EAC to provide content from FFRs and progress reports from 2020-2023 in a standardized data format, making it easier to analyze the content. Additionally, data from GLAS was more current and accurate than the FFRs, and progress reports are available in PDF form from 2020-2023. For example, some of the progress report spending categories had been updated retroactively in the grant management system to cover the same categories for all years, and errors in FFRs where amounts did not match had been corrected. However, FFRs from 2018-2019 and all program narratives were still in the PDF format and needed to be converted to include them in analyses.

METHODS

Methods can be found in Appendix A.

Key Areas of Election Security Grant Spending

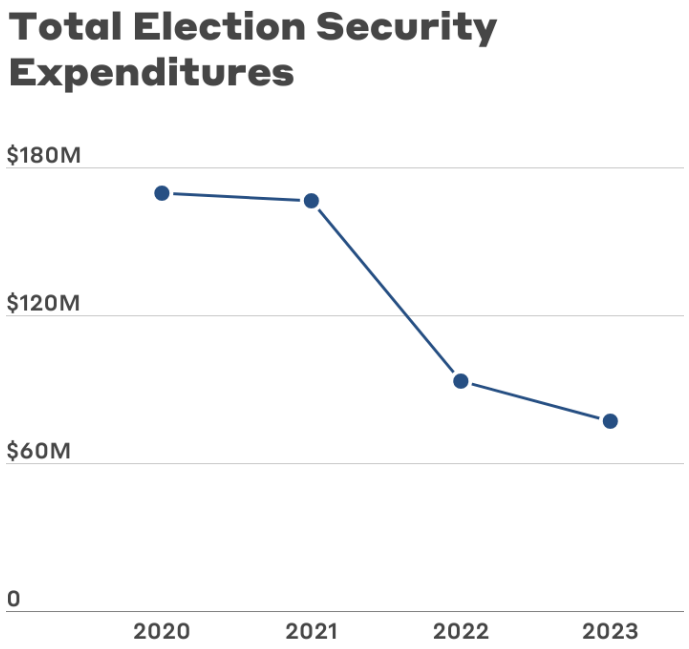


Figure 2. Total Election Security Grant expenditures from 2020-2023.

Election Security Grants can be used for a variety of election-related expenditures, such as to:

- replace voting equipment that only records a voter's intent electronically with equipment that utilizes a voter-verified paper record;
- implement a postelection audit system that provides a high level of confidence in the accuracy of the final vote tally;
- upgrade election-related computer systems to address cyber vulnerabilities;
- facilitate cyber security training for the state chief election official's office and local election officials;
- implement established cyber security best practices for election systems;
- improve and upgrade voter registration systems;

- acquire and update electronic poll books and other nonvoting election systems;
- fund other activities that will improve the security of elections for federal office.

We analyzed the specific areas in which HAVA funds have been spent between 2018-2023. We provide a comprehensive overview of expenditures by analyzing program narratives, progress reports, and Federal Financial Reports. Our analysis reveals significant investments in voting equipment and processes, voter registration systems, cyber security, election auditing, and accessibility.

Officials highlighted how HAVA grants have been pivotal in helping election officials address the evolving challenges of election administration, including upgrading outdated equipment, bolstering cyber and physical security, enhancing voter accessibility, improving poll worker training, and strengthening communication with constituents. State and local election officials underscored the importance of these federal funds, with one local official telling us that HAVA grants are an "essential funding source for us to implement security, accessibility, and more reliable operations for voters."

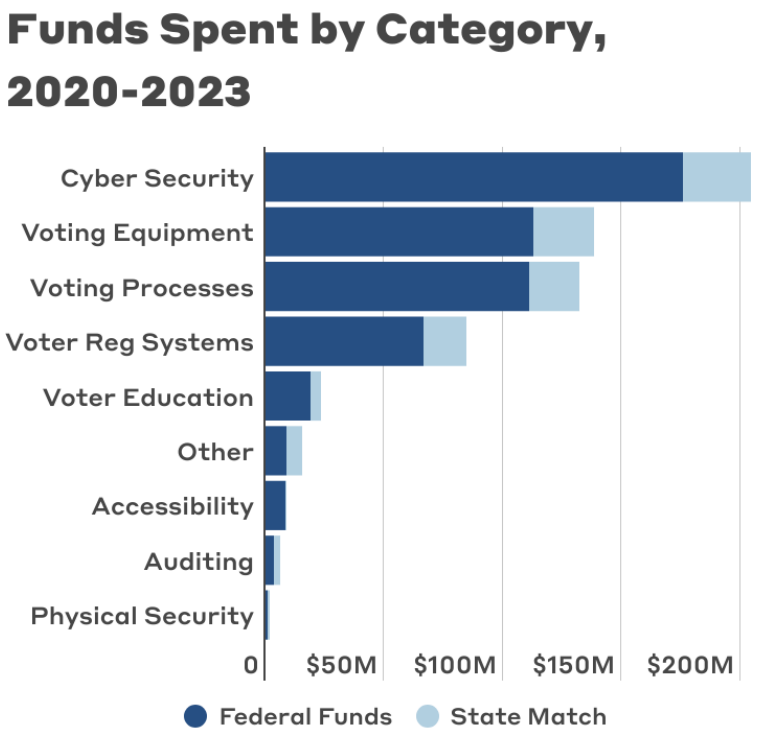


Figure 3. Categorical breakdown of Election Security Grant spending from 2020-2023, indicating the amount distributed by the EAC and the amount provided by states to meet the state matching requirement. Most spending fell into the categories of Cyber Security, Voting Equipment, and Voting Processes. Note: Data on expense categories was obtained from states' progress reports, which were collected beginning in 2020.

In the following sections, we break down Election Security expenditures by category and subcategory, providing new insight into how election administrators across the country have used HAVA funds recently to enhance their operations.

VOTING EQUIPMENT AND PROCESSES

The foundation of a well-run election is the ability to collect and count ballots efficiently and accurately. To do that, election officials need to have reliable voting equipment and resilient processes. Accordingly, voting equipment and processes constituted the bulk of Election Security Grant spending in recent years.

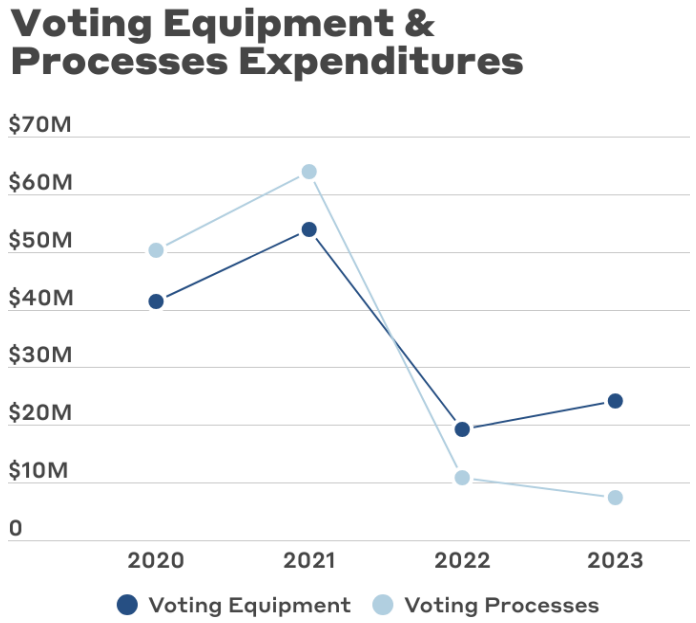


Figure 4. Election Security Grant expenditures on voting equipment and processes from 2020-2023.

From 2020-2023, states spent over $138.4 million on voting equipment and over $132.3 million on voting processes, accounting for nearly 44% of all Election Security Grant expenditures during this period. (We do not treat these as entirely separate categories here because they have not always been treated as separate categories in program narratives and progress reports.)

For each year analyzed, the vast majority (over 62%) of states said in their program narratives that they planned to spend Election Security funds on voting equipment and processes. When states mentioned the topic, they frequently (over 30% of the time) cited enhancing their cyber security or

physical security. More commonly (57.3%), they mentioned upgrading their voting systems such as their tabulators (17.7%), e-poll books for checking voters into polling places (13.7%), and ballot-marking devices for accessible in-person voting (11.3%).

Voting equipment represents a major investment that states make on an infrequent basis. Some states, such as Louisiana, have been awarded Election Security money that they intend to spend on voting equipment. Louisiana is working to secure a contract for new voting equipment but has not yet done so. Once it does secure that contract, the state will likely spend its awarded Election Security Grant money, which will represent just a small percentage of the total cost of the equipment.

States were much more likely in 2020 to mention plans to invest in mail voting equipment (twice as likely as in 2018 and 2022), and in other mail voting enhancements (at least four times as likely as in 2018 and 2022). These changes are likely related to the sudden increase of mail voting in 2020 due to the COVID-19 pandemic—this illustrates the impact of federal funds on addressing unexpected challenges.

In interviews, state and local election officials underscored the importance of obtaining federal funding to improve their voting equipment and processes. They told us that Election Security Grants enabled them to keep their equipment up to date by purchasing new tabulators and computers, or by replacing paperless electronic voting machines with systems that use paper ballots. A local election official in Hamilton County, OH, said that these upgrades have increased voter confidence. A North Carolina state election official said that HAVA funds dramatically improved voting equipment in the state, adding that grants "meant replacement for equipment or the purchase of first-time equipment for some jurisdictions that never had it before." Other officials talked about how HAVA funds enabled them to modernize their processes, such as by updating their absentee ballot processes to ensure "that ballots get to voters, the post office can accept them, and that they meet all our legal requirements to avoid being rejected." These investments have not only increased the security and reliability of elections but have also improved the overall voting experience.

CYBER SECURITY

Virtually every industry has become increasingly computerized, and election administration is no different. Given the evolving nature of cyber threats, it has become ever more important to protect election IT infrastructure against foreign or domestic intrusion. Accordingly, cyber security has become one of election officials' biggest expenses. The EAC supports election cyber security not only through its clearinghouse function but also by providing Election Security Grants to enhance cyber security.

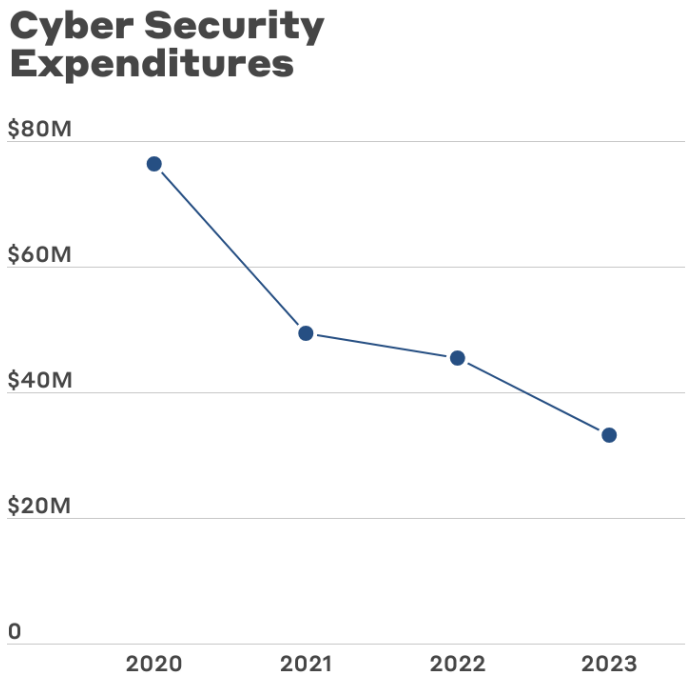


Figure 5. Election Security Grant expenditures on cyber security from 2020-2023.

Between 2020-2023, states spent over $204 million of Election Security Grant funds on cyber security, accounting for 33.2% of all Election Security spending in that period. Expenditures have decreased over time as the total size of the Election Security Grant program has decreased (Figure 1), and Election Security Grant program spending has correspondingly decreased (Figure 2). But cyber security continues to represent a relatively high proportion of overall expenditures; in most of the years we analyzed (2020, 2022, and 2023), cyber security spending accounted for over 30% of all Election Security expenditures. We see a similar pattern in program narratives: Even though 73.8% of states mentioned in program narratives that they planned to invest in cyber security, the percentage of states doing so decreased between 2018-2022 from 87.3% to 62.0%.

When states mentioned cyber security in their program narratives, they frequently (53.4% of the time) cited investing in cyber security training and training exercises. More frequently (69.5%), they mentioned plans to make improvements, such as by adopting more secure systems and protocols.

A local election official from Cranston, RI, told us that Election Security Grants enabled the jurisdiction to make critical improvements, including "upgrad[ing] four scanners that were no longer being supported with security patches, start[ing] a new cyber security training initiative, upgrad[ing] outdated back-end IT network infrastructure, [and] institut[ing] MFA [multi-factor authentication] using physical security keys."

After a North Carolina county government experienced a cyberattack during early voting in February 2020, the North Carolina State Board of Elections used HAVA funding to enhance election officials' ability to continue operations in the event of future attacks. They invented Attack Response Kits (ARKs), which consist of laptops, software, and other necessary tools to access the essential county infrastructure during an emergency. The kits also include reliable data and voice connectivity and battery backup for up to two days. With HAVA funds, the state Board of Elections was able to deploy ARKs at eight strategic locations across North Carolina, allowing for rapid deployment.

VOTER REGISTRATION SYSTEMS

With one exception,[6] states use a statewide voter registration system that contains the name and information for every registered voter, a requirement included in HAVA.

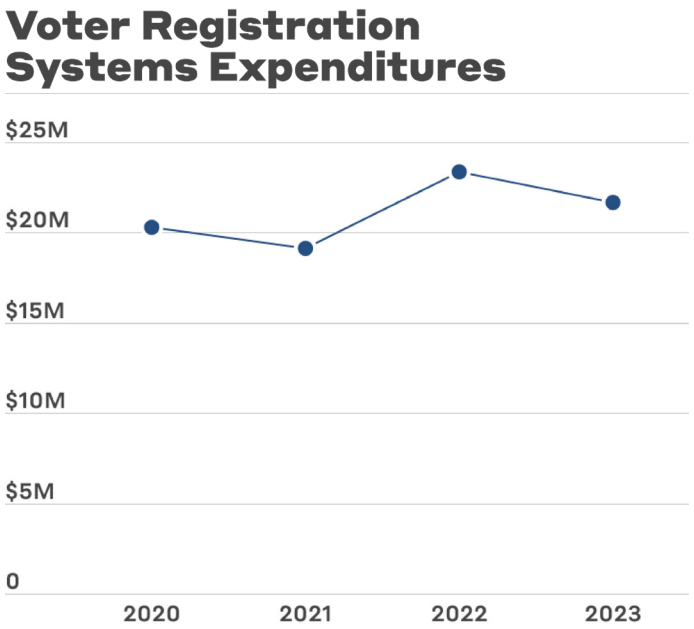


Figure 6. Election Security Grant expenditures on voter registration systems from 2020-2023.

Between 2020-2023, states spent over $84.4 million on voter registration systems, accounting for 13.7% of all Election Security expenditures in that period. Expenses have been relatively high—and stable—at around $20 million each year.

6 North Dakota does not employ a voter registration system; it instead allows individuals presenting a valid ID to vote. See How North Dakota Administers Elections Without Voter Registration | Bipartisan Policy Center.

As a portion of overall yearly expenditures, voter registration system expenditures were higher in 2022 and 2023—where they accounted for just over 20% of yearly expenditures—than in 2020 and 2021 (about 10% of yearly expenditures). This may be because new voter registration systems take time to purchase or develop and implement. To that end, voter registration systems were commonly mentioned as an area of planned investments, appearing in the program narratives of 65% of states. They were also mentioned consistently: Between 2018-2022, voter registration systems were mentioned by between 63% and 66% of states each year, in alignment with the consistent amount of Election Security funds invested annually.

ACCESSIBILITY

Making elections accessible to all voters, including those with disabilities, is a major responsibility of election officials and a key priority of the EAC. HAVA, as well as the Americans with Disabilities Act, established a clear mandate to ensure that Americans with disabilities be given the same opportunity to vote freely and independently as other voters. The bill contained landmark provisions requiring the secure, private, and independent casting of ballots for voters with disabilities and entrusted the EAC with leadership in this area.

Increasing election accessibility is intertwined with improving election security. Purchasing new equipment (e.g., updated voting machines) may enable election officials to improve security and auditability while simultaneously expanding access for voters with disabilities.

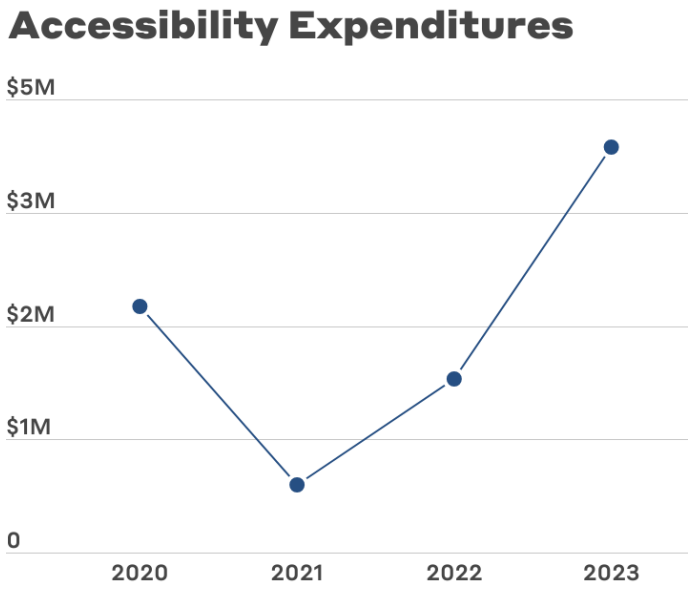


Figure 7. Election Security Grant expenditures on accessibility from 2020-2023.

Between 2020-2023, states spent over $8.8 million of Election Security Grant funds on activities and equipment related to election accessibility, accounting for 1.4% of all Election Security spending in that period. Almost half of those funds were spent in 2023. Accessibility was consistently mentioned as an area of planned expenses in states' program narratives, appearing in 21.3% of the narratives. When program narratives (between 2018-2022) mentioned accessibility, they often (32.4% of the time) mentioned spending on voting equipment. They also frequently (32.4%) mentioned spending on physical infrastructure to support accessibility.

In interviews, local election officials highlighted how HAVA funds have enabled them to improve accessibility. An official in Philadelphia discussed how HAVA funds allowed them to improve the physical infrastructure of public buildings that were being used as polling places, such as by adding ramps, doorbells, or door stops. HAVA funds also enabled Philadelphia officials to enhance the accessibility of their voting machines and to hire interpreters at key polling sites for voters with limited English proficiency.

Election Security funds allowed Los Angeles County, CA, to produce a video tool for training election workers and election support staff on how to interact with voters with disabilities. The video includes closed captioning, an American Sign Language interpreter, and subtitles in 13 languages to ensure it is accessible to all election workers and can be used by various community groups.

HAVA funds, including Election Security Grants, play a key role in helping election officials meet the accessibility needs of their voters, ensuring that everyone can cast their vote with minimal obstacles in their path.

EDUCATION

Communicating with the public has become an increasingly large part of election officials' portfolio. The EAC has put together a number of resources for election officials to enhance their ability to educate the public on how to vote, communicate about crises, and ensure that voters have access to information from trusted sources. But communicating effectively costs money; some larger jurisdictions opt to have full-time staff dedicated to communications.

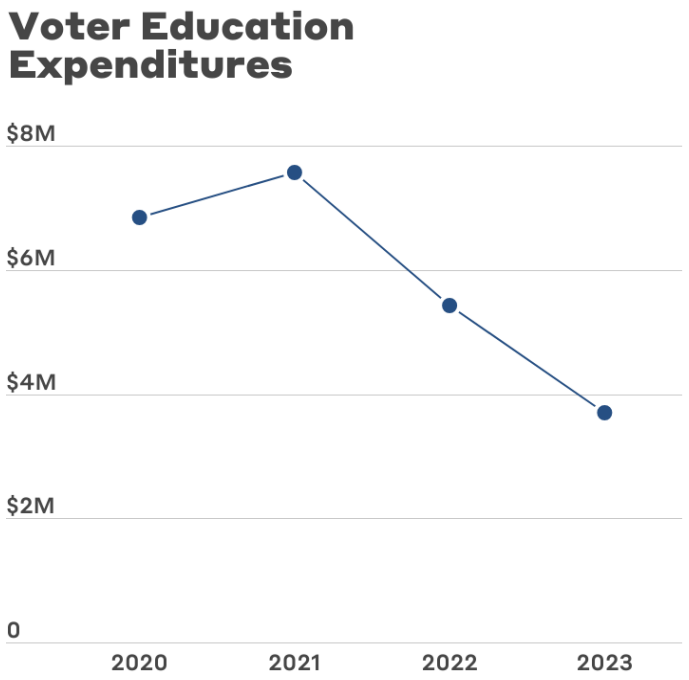


Figure 8. Election Security Grant expenditures on education from 2020-2023.

Between 2020-2023, states spent over $23.5 million of Election Security Grant funds on education, accounting for 3.8% of all Election Security expenditures in that period. Education was discussed consistently in program narratives, appearing in over 40% of narratives in each year analyzed.

When program narratives discussed education, they frequently (42.4% of the time) mentioned plans to provide general education to voters, such as by providing information to voters about registration or new policies.

Program narratives that discussed education also commonly (24.2%) mentioned plans to build public trust, and election officials reported that this was a valuable use of funding. Maricopa County, AZ, said it has hosted over 100 voter outreach events, including tours of the facility to demonstrate equipment. One official told us that "demonstrating security protocols helps build trust in the system; it is essential for the public and the media to understand the security upgrades we have implemented through HAVA funding." A Philadelphia official underscored the importance of not only making security upgrades but also communicating about them proactively: "It really comes down to communication. Voters respond well to upgrades in voting systems, as long as we are out there making voters aware of the changes."

PHYSICAL SECURITY

Protecting the physical integrity of voting equipment, securing ballots, and keeping election officials and poll workers safe are critically important. Materials provided by election officials for this report indicate that HAVA funds have enabled them to improve physical security that upholds election integrity and worker safety.

Maricopa County used Election Security Grant funds to significantly improve the physical security of their ballot tabulation center. Maricopa is the largest county in Arizona, accounting for over 60 percent of the state's registered voters. Maricopa was able to make major upgrades to their ballot tabulation center where ballots are stored and tabulated. Before the 2020 election, Maricopa stored ballots in boxes under sprinklers, putting them at risk of water damage in case of a fire. With a HAVA Election Security Grant, officials were able to move ballots into a vault under a dry fire suppression system, ensuring safe long-term ballot storage. They were also able to make other changes that increased both security and transparency, such as moving their servers into a glass room visible to the public from the lobby and online. Last, they were able to purchase port blockers and other security enhancements to prevent unauthorized outside devices from connecting to the county's networks.

A number of officials reported using HAVA funding to purchase and install security cameras for the inside and outside of their facility and to monitor their mail ballot drop boxes. Several other officials reported using HAVA funds to harden their facilities' security with new locks, including a bipartisan locking system that requires members of opposing political parties to be present to unlock certain areas.

The City of Philadelphia used HAVA grants to support its move into a new facility with enhanced physical security and transparency for observers. One official from Stevens County, WA, wrote that Election Security funds enabled them to set up a new ballot processing facility with a secure "alley" for election observers to safely and securely observe processes. The official also noted that this was a major improvement over the previous physical security, which consisted of a line of caution tape on the ground.

We do not have historical data for this category of spending, as it was only included as a distinct category for progress reports for the first time in 2023; previously, expenditures were pooled with cyber security or reported in other major categories. In that year, states reported spending over $1.8 million on physical security.

AUDITING

Election audits are a key component of a well-run election. Election officials carry out audits before and after elections, checking that their office procedures were in compliance with regulations, internal policies, and state law; identifying and resolving discrepancies; making sure equipment works well before an election; or ensuring that election outcomes were correct.

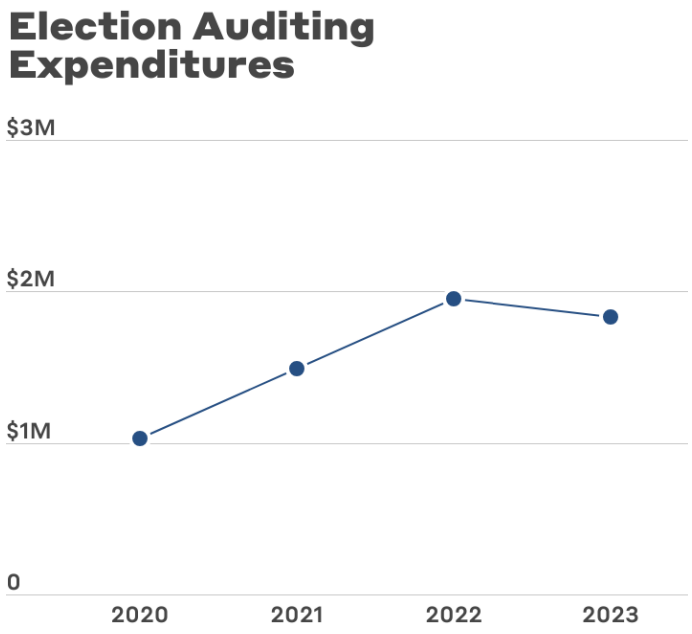


Figure 9. Election Security Grant expenditures on election auditing from 2020-2023. Annual election auditing expenditures have nearly doubled since 2020.

Between 2020-2023, states spent over $6.3 million of Election Security Grant funds on activities and equipment related to election auditing, accounting for 1.0% of all Election Security spending in that period. Across the program narratives that we analyzed, whenever auditing was mentioned, it was usually (90.9% of the time) in the context of performing an election audit, such as a post-election audit to verify that the outcome was correct. By contrast, investing in election auditing software was mentioned only 18.2% of the time. This suggests that Election Security Grants enable election officials to perform more, or more comprehensive, post-election audits. This is an important function that Election Security Grants can support; security researchers have long been recommending expanding post-election auditing, and policymakers and the public have been increasingly interested in post-election audits in recent years.

TRAINING

Because training is covered under other major categories, we do not have a precise accounting of the amount of Election Security Grant spending associated with training (e.g., cyber security training is covered under the Cyber Security topic). Additionally, "training" encompasses various information-sharing formats, including traditional instructional design, online resources, and tabletop exercises. But training is clearly a major focus of Election Security Grant expenditures: Training for election office staff is mentioned in more than half of all program narratives between 2018-2022. In state progress reports for 2023, 30 states reported using funds for training, including workshops and tabletop exercises in partnership with the Cybersecurity and Infrastructure Security Agency (CISA).

We identified four categories of training in the program narratives: training related to cyber security; general training for election officials; training on election processes, policy, and other election-related topics; and training on topics related to accessibility. Cyber security training was the dominant topic; of the program narratives that mentioned plans to spend Election Security funds on training, 67.7% discussed training and exercises related to cyber security.

In interviews, election officials spoke to the key role that HAVA funds play in enabling a well trained election workforce. In Maricopa County, officials used HAVA funding to develop an in-house training platform for administering online training to poll workers, the volunteers who staff a polling place. The training is always available to the poll workers so that they can refer to it during their work, reducing the chance of worker error. A Wisconsin state election official also told us that "without HAVA funds, local election officers wouldn't have been able to attend training. That would directly impact the security of our elections."

Why Haven't All Election Security Grants Been Spent?

As of June 14, 2024, states have spent over $604 million, or approximately 63% of the $952 million of Election Security funds they have received between 2018-2023. (See Figure 10 for a visualization of the degree to which each state has spent its received funds.)

Election officials report that the unpredictability of federal funding, the need to budget for large expenses, and state legislative barriers explain the variation among spending levels.

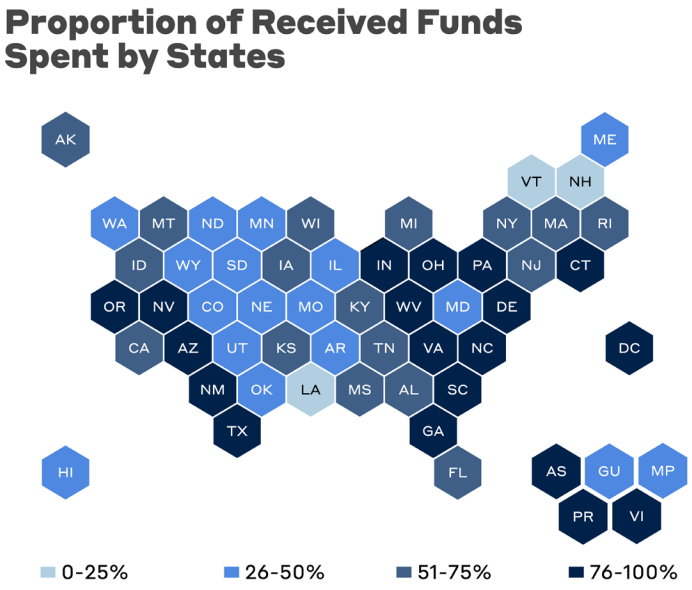


Figure 10. Percent of Election Security Grants expended by states as of August 8, 2024. Source: HAVA Election Security Grant Expenditures, U.S. Election Assistance Commission.

Cost of U.S. Elections since the Help America Vote Act, 2002-2024

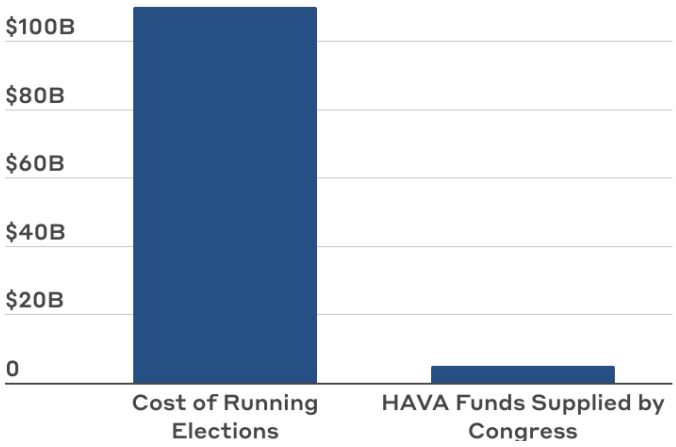


Figure 11. The total amount of HAVA funds ($5.005 billion since 2002) covers just a fraction of the total cost of running elections, which was estimated in 2022 as "being in the range of $4 billion to $6 billion, in a 'normal' year." (For this figure we visualize the cost as $5 billion per year.)

Congress has allocated $5.005 billion in election administration funding since 2002. That amount covers just more than 4.5% of the estimated total cost of running elections in this period (Figure 11). Although elections were designated as critical infrastructure in 2017, federal investment remains irregular, unpredictable, and insufficient.

The variability in funding across states and jurisdictions leads to inconsistent services for voters. While some areas can afford to invest in improvements such as new equipment, voter education, and additional staff, others struggle to cover the basic costs of running elections.

Federal funding can serve as an equalizing force, particularly for election security. The first round of HAVA funds, for instance, transformed voting equipment after the 2000 election revealed the accuracy issues with punch card voting systems. Yet a 2018 report by the U.S. Government Accountability Office observed that "much of the voting equipment that was procured by state and local election administrators with federal funds more than 10 years ago is now at or approaching the end of its designed service life." Even when voting

systems are not at the end of their designed service life, it may be worthwhile for election officials to upgrade; technology has matured so much in recent years that new systems may be dramatically more secure and auditable.

A state official from North Carolina echoed that while early HAVA funds enabled states to make large investments in new voting equipment, subsequent HAVA funding has not been sufficient to build on that progress, leaving many jurisdictions without adequate funds to cover replacement costs.

This funding inconsistency is a key reason initial spending rates for federal grants are often low: Election officials cannot depend on regular funding, so they must save the funds they do receive to plan for large investments. In Maine, for example, it took four years to negotiate and approve a $1.8 million contract to establish a new voter registration system. Although the Election Security funds were distributed in 2018, the contract was not signed until 2022.

In addition to the planning associated with approving the purchase of a system, many systems require ongoing maintenance costs, meaning long spend-down periods. In Illinois, for example, $9 million in Election Security funds were used to implement a cyber navigator program as of September 2021. The remaining money was earmarked for expansion of the program.

When it comes to federal support, election administrators prioritize the need for consistent and predictable funding over any specific amount. The president's fiscal year 2024 budget proposed "$5 billion in new election assistance funding to be allocated over 10 years." But there remains a substantial gap between the proposed budget and congressional appropriations.

LEGISLATIVE APPROVAL OF EXPENDITURE AND MATCHING FUNDS

Budgetary issues at the state level can delay or block the use of federal funding. In some states, the legislature must approve the use of HAVA grants even after the EAC has awarded the funds. This requirement can cause delays, especially if the grants are approved outside the regular legislative calendar. Gridlock can leave federal funds in limbo, preventing state and local election authorities from accessing approved grants until an agreement is reached on their use.

Even when legislative approval is not required to spend HAVA funds, legislative action may be required to comply with the state match requirements of Election Security Grants. Not only can this delay spending but state governments sometimes struggle to find matching funds in the budget when federal funds arrive sporadically.

Conclusion

Election Security Grants support the aspects of elections that stakeholders and others widely acknowledge as essential: secure and accessible voter registration, accurate ballot tabulation, auditable results, and safe and secure election facilities.

Despite the tangible benefits Election Security Grants have provided to election administration since 2018, election security is a moving target. As technology changes over time, election offices must be able to replace outdated systems and respond to new vulnerabilities on an ongoing, iterative basis. Moreover, there are potential national security consequences if modern, secure voting and election systems are not funded.

Election officials cannot fully mitigate election security risks without addressing chronic resource shortages. Each election official we interviewed agreed that increased federal funding at predictable intervals would enable them to provide more secure elections and better service to voters in their jurisdictions.

Election offices were well prepared for the 2024 presidential election, thanks in large part to the federal funding allocated to date. However, ongoing federal support is critical to their ability to address emerging challenges and to maintain secure and resilient election systems for years to come.

About the Authors

BIPARTISAN POLICY CENTER

The Bipartisan Policy Center is a mission-focused organization helping policymakers work across party lines to craft bipartisan solutions. The BPC Elections Project develops and advances durable, bipartisan policies to create secure, accessible, and trustworthy elections. We envision broad public trust in election outcomes, where election administration is funded fully and improved continually with the input of election practitioners.

FORS MARSH

Fors Marsh, a certified B Corporation based in Arlington, VA, is a research firm that combines science and strategy to create lasting change and improve people's lives. It works with clients to address societal challenges through data-driven impact, evidence-based strategies, and creativity. Its elections work includes partnerships with the EAC, the Federal Voting Assistance Program (FVAP), the Office of the District of Columbia Auditor (ODCA), the Harris County, TX, Office of County Administration, and others to collect and analyze data to improve the administration of elections in the United States.

Fors Marsh served as BPC's research partner on this project, conducting analyses of grant-reporting data and progress reports supplied by the EAC to identify trends and highlight key issues. The findings were used to support the conclusions and recommendations in this report.

U.S. ELECTION ASSISTANCE COMMISSION

The EAC is an independent, bipartisan commission charged with providing resources to state and local governments for election administration. Established by the Help America Vote Act of 2002 (HAVA), the EAC was created to provide election officials with assistance, guidelines, and research on best practices for running elections. The EAC is governed by four commissioners—two Republicans and two Democrats—appointed by the president and confirmed by the U.S. Senate.

Appendix A: Methods

The conversion of 2018 and 2019 FFRs from PDFs to a dataset was conducted using image recognition. The research team created an automated process using the "pdftools" and "tesseract" packages in R that processed the FFRs and exported the relevant contents (i.e., dollar amounts in the "Transactions" section) to a dataset. This process was challenging, because documents varied in image contrast, noise, and slant. However, the text normalization successfully exported the data that was later reviewed to ensure accuracy (see Appendix B for more details on this process).

Because states' program narratives are unstandardized text reports, converting them into a dataset involved coding the text and classifying them into discrete categories for each of the 160 available program narratives. To address the challenge of classifying documents, the team used a Natural Language Processing (NLP)-based approach to automate the process. NLP-based strategies can evaluate large bodies of documents and provide information about the contents of the documents in a fraction of the time that manual coding would involve. The process to conduct the coding involved the following steps:

1. After inspecting a sample of program narratives, the topics discussed in the documents seemed to align with those covered in progress reports. Thus, the team used topics and subtopics from the 2022 progress reports made available by the EAC as the initial categories for document classification (see Appendix C for the full list of main topics and subtopics).
2. Two coders categorized 39 program narratives total (13 from each year available) into the main topics and subtopics described in Appendix C.
3. The resulting coded dataset was used to "train" the predictive machine-learning algorithm so it could identify the desired categories.
4. The results of the algorithm were evaluated by a coder to assess the classification accuracy using a sample of eight program narratives. The results showed that the algorithm had a tendency for false negatives (i.e., not reporting a topic as present when it was indeed present). Accuracy within the reviewed narratives was about 65% for main topics and 75% for subtopics. These results, while better than chance, were deemed as not accurate enough for analysis. Thus, an additional step was conducted.

5. Two coders manually reviewed all the algorithm-generated categorizations and corrected any misclassifications. This resulted in a final dataset with classified topics for all 160 program narratives available from 2018 to 2022.

The process outlined above resulted in a final dataset with classified topics for all 160 program narratives available from 2018-2022. This dataset allowed us to analyze the prevalence of each main and subtopic over time and at the national level. (For a full discussion of the program narratives categorization process and lessons learned from the use of machine learning in these documents, see Appendix B.)

We complemented quantitative analyses with in-depth interviews with state and local election officials. We began by hosting a focus group with BPC's Task Force on Elections, a geographically and politically diverse group of more than 30 state and local election officials. Following the focus group, we scheduled and conducted interviews with individual members. We also solicited election officials to email us with examples of improvements that Election Security Grants enabled them to make.

We also used public records from the EAC's National Clearinghouse Awards. These awards recognize exceptional uses of HAVA funding, voter education efforts, and innovation by state and county election officials. The detailed descriptions required for these award applications provided valuable information.

Appendix B: Federal Financial Report and Program Narratives Data Collection

Appendix B discusses in detail the processes involved in extracting data from the Federal Financial Reports (FFRs) and program narratives to analyze their content.

FEDERAL FINANCIAL REPORTS (FFRS)

FFRs from 2018-2019 were available only in the PDF format. For 2020-2023, following implementation of the EAC's grants management system (GLAS), content from the FFRs was available in both the PDF and spreadsheet formats.

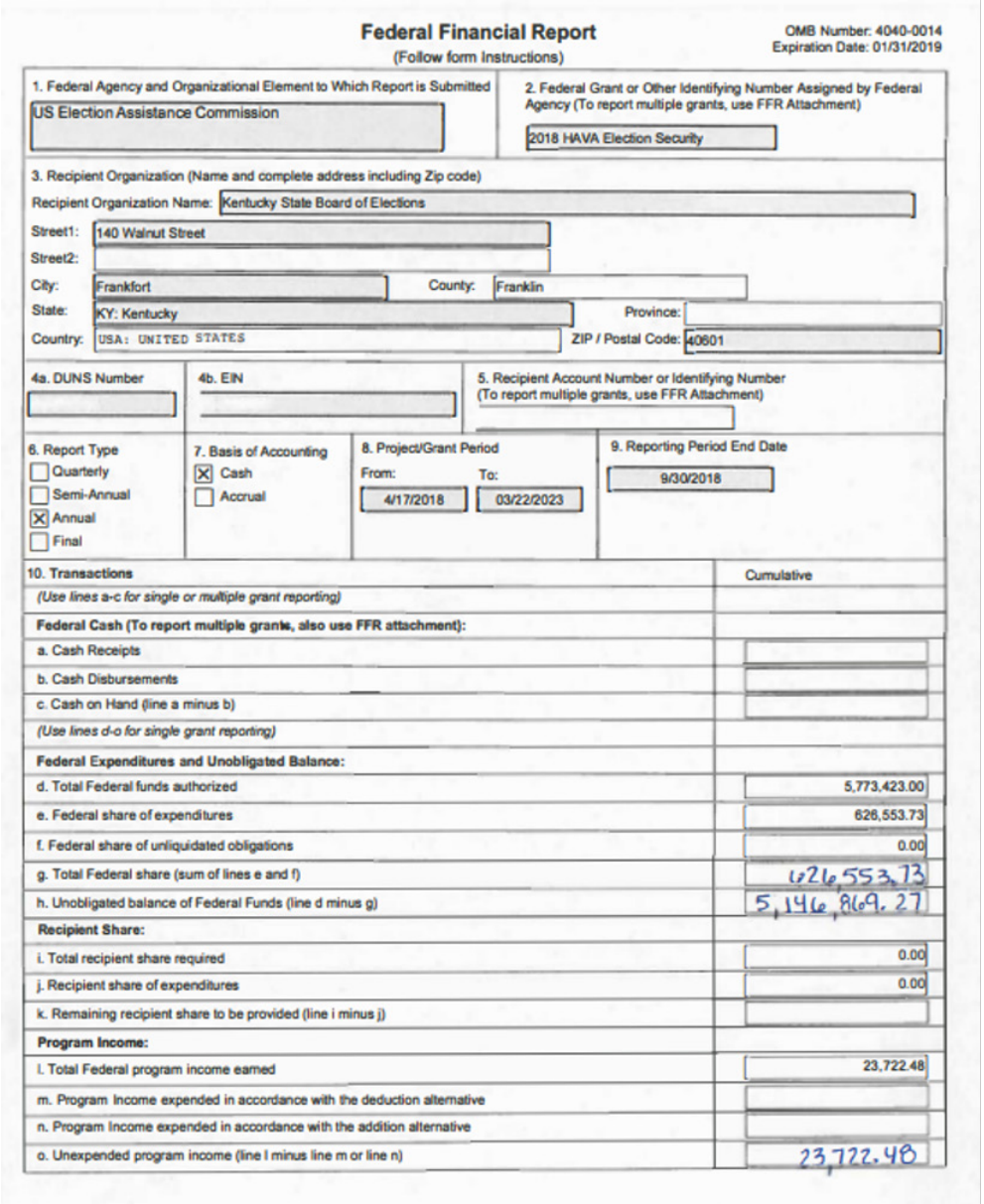
To extract the data necessary for the analysis, the research team used image recognition to create an automated process using the "pdftools" and "tesseract" packages in R that processed the FFRs and exported the relevant contents (i.e., dollar amounts in the "Transactions" section of the FFRs) to a dataset.

Documents varied in image contrast, noise, and angles of text (i.e., not all documents had fully horizontal text). This is because some documents were in standard PDF formats, while others were manually scanned documents. PDF-formatted documents were generally easy to ingest, as PDF-based tools could be used to automate the ingestion of text—although color contrast was occasionally an issue. Scanned documents, on the other hand, tended to feature a host of complications, including faded ink lines, noise in the form of light issues in scans (leaks) creating occasional ink-like smudges, and orientation issues when documents were scanned at an angle. (See Image B1 as an example of a scanned FFR.)

The greatest challenge was that scanned documents required using image recognition and processing tools, which are more prone to error than a tool that is specifically designed for text extraction from PDFs. As a result, numbers could occasionally come in as non-numeric characters and other characters could be misread, creating formatting issues (e.g., the image recognition software could read "7" as "/"; or it could read "," as ".").

Text normalization and regular expressions were used to correct ingestion issues and format tables as an Excel spreadsheet. The research team used

rules-based logic to identify and correct ingestion issues, in some cases with end-to-end automation and in others requiring manual review. Accounting rules specified in the documents were enforced. For example, the process ensured that line "10b. Cash Disbursements" was subtracted from line "10a. Cash Receipts" in line "10c. Cash on Hand," as this line contained the accounting instructions "line a minus b." This process allowed us to export the final data into spreadsheet format with end-to-end automation.



Federal Financial Report

(Follow form Instructions)

OMB Number: 4040-0014
Expiration Date: 01/31/2019

1. Federal Agency and Organizational Element to Which Report is Submitted: US Election Assistance Commission

2. Federal Grant or Other Identifying Number Assigned by Federal Agency (To report multiple grants, use FFR Attachment): 2018 HAVA Election Security

3. Recipient Organization (Name and complete address including Zip code)

Recipient Organization Name: Kentucky State Board of Elections
Street1: 140 Walnut Street
Street2:
City: Frankfort
County: Franklin
State: KY: Kentucky
Province:
Country: USA: UNITED STATES
ZIP / Postal Code: 40601

4a. DUNS Number
4b. EIN
5. Recipient Account Number or Identifying Number (To report multiple grants, use FFR Attachment)

6. Report Type: ☐ Quarterly ☐ Semi-Annual ☒ Annual ☐ Final
7. Basis of Accounting: ☒ Cash ☐ Accrual
8. Project/Grant Period: From: 4/17/2018 To: 03/22/2023
9. Reporting Period End Date: 9/30/2018

10. Transactions	Cumulative
(Use lines a-c for single or multiple grant reporting)	
Federal Cash (To report multiple grants, also use FFR attachment):	
a. Cash Receipts	
b. Cash Disbursements	
c. Cash on Hand (line a minus b)	
(Use lines d-o for single grant reporting)	
Federal Expenditures and Unobligated Balance:	
d. Total Federal funds authorized	5,773,423.00
e. Federal share of expenditures	626,553.73
f. Federal share of unliquidated obligations	0.00
g. Total Federal share (sum of lines e and f)	626,553.73
h. Unobligated balance of Federal Funds (line d minus g)	5,146,869.27
Recipient Share:	
i. Total recipient share required	0.00
j. Recipient share of expenditures	0.00
k. Remaining recipient share to be provided (line i minus j)	
Program Income:	
l. Total Federal program income earned	23,722.48
m. Program Income expended in accordance with the deduction alternative	
n. Program Income expended in accordance with the addition alternative	
o. Unexpended program income (line l minus line m or line n)	23,722.48

Image B1: Scanned FFR – Kentucky, 2018

After all the data was exported, it was manually reviewed to address any recognition issues during the image recognition process to ensure that the amounts in the final dataset were accurate.

PROGRAM NARRATIVES

States requesting Election Security Grant funds are required to complete program narratives every year that funding is appropriated. In these program narratives, states discuss the areas where they plan to spend the Election Security Grant funds awarded to them in that appropriation year. These narratives are unstandardized text documents (unlike forms such as FFRs) and vary in length and organization from state to state and year by year. They can range from a few paragraphs to several pages and can be organized in bullet points or in full-text paragraphs. The goal of converting them into a dataset involved coding the text and classifying it into discrete categories for each of the 160 available program narratives.

To address the challenge of classifying many documents, the research team used a natural language processing (NLP)-based approach. NLP refers to a broad collection of methodologies and strategies that incorporate features of human language (text and speech, for example) for statistical or machine learning-based analytical solutions. NLP-based strategies are particularly helpful and applicable for this project because they contain the capacity to evaluate large bodies of documents and provide information concerning the contents of these documents in a fraction of the time that manual review by a coder or team of coders would take.

The research team used a popular NLP method known as Latent Dirichlet Allocation (LDA). LDA treats each document as a combination of topics, which themselves are a combination of words within the collection of documents. A user of this algorithm defines several topics for the algorithm to "look for," and the algorithm subsequently "finds" the same number of topics, regardless of whether these topics are substantively meaningful or interpretable. With these topics estimated by LDA, one can extract per-document-per-topic probabilities, which reflect, for each document, the percentage of words that originate from each topic. For example, for program narrative X, we may use LDA to estimate four topics and find that the per-document-per-topic probability value for topic 1 is 0.13. This hypothetical result would tell us that around 13% of the words in program narrative X are from topic 1.

The use of LDA can be exploratory (attempting to find unknown topics in a collection of documents) or predictive (using per-document-per-topic probabilities as predictors in a machine-learning algorithm). For this project, the research team used the predictive approach, as it allowed us to document the classification of the topics. After reviewing a sample of program narratives, it seemed apparent that topics were heavily influenced by the categories discussed in progress reports. We used coded documentation from the EAC that identified eight main topics and 54 subtopics from the progress narrative portion of the progress reports of 2022. This served as a starting point to manually code a random sample of 39 program narratives (13 state

program narratives for each year) that would serve as training data for our predictive machine-learning algorithm. If new subtopics were identified by the coders, those were included in the coded sample (only the subtopic "Election Misinformation" within "Education" was included). Likewise, if a prespecified subtopic was not identified in the randomized subset, that subtopic was not included in the classification analysis (e.g., the subtopic "Ballot Imprinters" within the main topic "Audits"). The final list of main topics and subtopics is available in Appendix C.

Following the manual coding of the randomized subset of program narratives (the "training" data), the research team trained a popular machine-learning algorithm known as a *random forest classifier* on these documents to classify each document's main and subtopics. This algorithm used LDA-generated per-document-per-topic probabilities as predictors in the model for each main and subtopic. Following the training of the model, the per-document-per-topic probabilities for each nonclassified document were "plugged into" the trained algorithm and classified to their predicted main and subtopic(s).

As there is always some amount of error associated with predictive models, a coder reviewed eight randomly selected program narratives coded by the algorithm. The results showed that the algorithm had a tendency for false negatives (i.e., not reporting a topic as present when it was indeed present). False negatives seemed to be a result of the algorithm needing a topic to be thoroughly discussed in the program narrative to flag it, thus having difficulties identifying it when it was mentioned in just one line of the program narrative (as happened in multiple cases). Another issue for predictive accuracy originated from the complicated content written within the program narratives. Specifically, several program narratives discussed how prior HAVA grant funding was spent. This resulted in several complications, because the NLP-based approach extracted topics from each document, regardless of the context in which these topics were discussed. For example, if a given program narrative discussed intentions to spend the funding on cyber security and voting equipment, the model should be able to code this program narrative according to these categories. However, this given program narrative may have also discussed how prior HAVA grant funds had been used for accessibility and audits. As a result, the model would code this program narrative as belonging to all four topics, even though the current funding being discussed in the program narrative only discussed intentions to spend funds on cyber security and voting equipment.

Additionally, the smaller size of the training set appeared to create problems for predictive accuracy. These complications were especially notable for the classification of subtopics, some of which were sparsely represented in the training sample. A consequence of this is that predictions yielded from the trained algorithm were incredibly sensitive to the small number of labeled documents (or, in some cases, a single document) that contained contents

related to a “rarer” subtopic. However, this issue could be overcome by increasing the number of labeled documents to serve as training data, as this should lead to increased predictive accuracy. Subsequent algorithms trained on more documents with more diverse information are likely to yield predictions that are less sensitive to a low number of coded documents.

To account for the predictive errors from our NLP-based approach, the research team manually reviewed each document using two coders and compared manual classifications to model-predicted classifications. Overall, while the model results were better than pure-chance, predictive error rates were deemed as not accurate enough for analysis. For example, on average, the predictive accuracy rate for the main topics was around 65%, while the predictive accuracy rate for the subtopics was around 75%. However, it is important to note that the total predictive accuracy varies by both main topics/subtopics and, more specifically, their sensitivity (accuracy of predicting whether a document belongs to a given topic) and specificity (accuracy of predicting whether a document does not belong to a given topic).

The manually reviewed version of the coded 160 program narratives was used in the analysis of this report. Overall results by year can be found in tables D6 and D7 in Appendix D.

Appendix C: Program Narratives: Topic Descriptions

Topic	Description
Voting Equipment and Processes	
Tabulators	Funds allocated for vote tabulators
Ballot Marking Devices (BMDs)	Funds allocated for BMDs
New Upgraded System	Funds allocated for new voting equipment not covered above and upgrades to voting equipment (e.g., new scanners, updated software licenses for current voting equipment)
E-Poll Books	Funds allocated for e-poll books
Absentee Mail Voting Equipment	Funds allocated for voting equipment directly related to mail voting (e.g., high-capacity mail opening devices, drop boxes)
General Voting Equipment Supplies	Funds allocated for other supplies directly related to the voting process and voting equipment (e.g., extension cords)
Voting Accessibility Equipment	Funds allocated for equipment directly related to accessible voting (e.g., accessible voting devices)
Election Staffing	Funds allocated for additional election staff
Voting Process Enhancements	Funds allocated for improvements in the voting process and election administration (e.g., poll place locator services, election administration assessments)
Election Training	Funds allocated for staff training on election processes, policy changes, and other election-related topics
Absentee Mail Voting Enhancements	Funds allocated for enhancements related to mail voting (e.g., mail ballot tracking services)
Cyber and/or Physical Security	Funds allocated for improvements on cyber security and physical security; physical security equipment and processes can include security cameras, locks, cages for equipment, etc.
Voting Accessibility Support	Funds allocated for processes and equipment related to accessible voting that are not voting equipment devices
Voter Registration Systems (VRS)	
Registration System Improvements	Funds allocated for improvements in the VRS
Registration System Maintenance	Funds allocated for maintenance of the VRS
Registration System Security	Funds allocated for VRS security activities and enhancements

Topic	Description
Cyber Security	
Security Training Exercises	Funds allocated for training covering some aspect related to cyber security
Cyber Security Monitoring Testing	Funds allocated for monitoring and testing cyber security in any environment related to elections (e.g., voter registration systems, internal networks, servers)
Physical Infrastructure	Funds allocated for improving physical infrastructure of components related to cyber security (e.g., new laptops, secure drives)
Cyber Security Improvements	Funds allocated for any type of improvement related to cyber security, such as adoption of more secure systems and protocols
Authentication	Funds allocated for implementation of multi-factor authentication (MFA) in any voting-related system (e.g., voter registration system, internal network systems)
Staffing	Funds allocated for new staff with duties directly related to cyber security
Incident Preparedness	Funds allocated for incident preparedness in the event of a cyber security-related threat
Standard Compliance	Funds allocated for meeting cyber security compliance guidelines
Auditing	
Election Audit Performance	Funds allocated for conducting election audits, including risk-limiting audits
Audit Software	Funds allocated for software used to conduct election audits
Subgrants to Counties	Election Security (ES) funds distributed by states to counties in the form of grants; counties are allowed to spend the funds in any of the ES spending categories authorized by states
Voter Education	
General Education	Funds allocated for voter education in election-related topics (e.g., voting equipment, new policies)
Public Trust Outreach	Funds allocated for outreach efforts to the public on election topics, such as voting rights, procedures, and technology, to increase voters' awareness of the election process
Election Official Training	Funds allocated for training of election officials on any aspect of the elections, including those related to providing election officials with tools to provide voter education to the public
Election Misinformation	Funds allocated for combating election misinformation

Topic	Description
Training	
Election Training	(See description in Voting Equipment and Processes)
Security Training Exercises	(See description in Cyber Security)
Election Official Training	(See description in Voter Education)
Accessibility Training	(See description below in Accessibility)
Accessibility	
Accessibility Physical Infrastructure	Funds allocated for improvements/new physical infrastructures (mainly in vote centers, polling places) to improve accessibility
Accessibility Training	Funds allocated for training election workers, staff, and/or officials on topics related to accessibility
Voting Accessibility Equipment	(See description in Voting Equipment and Processes)
Voting Accessibility Support	(See description in Voting Equipment and Processes)
Other Accessibility	Funds allocated for other accessibility-related resources like program assistance to localities, accessibility supplies, hardware, and software

Appendix D: Topline Tables

The tables below provide overall results and insights from the compilation of data from the Progress Reports, FFRs, and Program Narratives.

Table D1. Federal Funds from Election Security Grants Spent by Category and Year, Based on Annual Progress Reports.

	2020	2021	2022	2023	Total
Voting Equipment	$30,845,154.61	$50,953,089.39	$15,148,971.83	$15,708,586.13	$112,655,801.96
Voting Processes	$45,860,943.62	$52,138,471.33	$5,973,534.18	$6,968,805.06	$110,941,754.19
Voter Registration Systems	$17,131,541.04	$14,837,330.88	$18,563,560.90	$15,867,314.27	$66,399,747.09
Election Auditing	$724,946.65	$699,345.24	$626,326.05	$1,561,943.63	$3,612,561.57
Cyber Security	$66,072,491.80	$39,757,067.17	$42,687,790.05	$27,359,066.08	$175,876,415.10
Physical Security	-	-	-	$918,665.89	$918,665.89
Voter Education	$6,114,032.37	$4,820,508.61	$5,217,145.75	$2,596,852.31	$18,748,539.04
Accessibility	$2,341,805.11	$326,662.50	$1,720,753.52	$4,021,787.26	$8,411,008.39
Other	$365,974.27	$2,987,028.80	$3,503,511.05	$2,175,434.43	$9,031,948.55
Total	**$169,456,889.47**	**$166,519,503.92**	**$93,441,593.33**	**$77,178,455.06**	**$506,596,441.78**

Table D2. State Match Funds from Election Security Grants Spent by Category and Year, Based on Annual Progress Reports.

	2020	2021	2022	2023	Total
Voting Equipment	$10,509,166.84	$2,902,526.95	$3,999,939.15	$8,383,696.25	$25,795,329.19
Voting Processes	$4,385,474.85	$11,737,695.30	$4,855,847.24	$405,610.00	$21,384,627.39
Voter Registration Systems	$3,145,882.70	$4,273,382.76	$4,804,195.14	$5,807,537.42	$18,030,998.02
Election Auditing	$305,594.81	$791,568.41	$1,328,064.45	$270,585.19	$2,695,812.86
Cyber Security	$10,248,643.06	$9,692,704.57	$2,724,332.74	$5,889,988.27	$28,555,668.64
Physical Security	-	-	-	$949,641.00	$949,641.00
Voter Education	$724,719.07	$2,741,419.27	$215,045.82	$1,097,155.26	$4,778,339.42
Accessibility	$101,872.49	$344,461.00	-	-	$446,333.49
Other	$565,781.55	$114,407.16	$5,157,102.48	$651,965.55	$6,489,256.74
Total	**$29,987,135.37**	**$32,598,165.42**	**$23,084,527.02**	**$23,456,178.94**	**$109,126,006.75**

Table D3. Total Funds from Election Security Grants Spent by Category and Year, Based on Annual Progress Reports (Federal and State Match Funds Combined).

	2020	2021	2022	2023	Total
Voting Equipment	$41,354,321.45	$53,855,616.34	$19,148,910.98	$24,092,282.38	$138,451,131.15
Voting Processes	$50,246,418.47	$63,876,166.63	$10,829,381.42	$7,374,415.06	$132,326,381.58
Voter Registration Systems	$20,277,423.74	$19,110,713.64	$23,367,756.04	$21,674,851.69	$84,430,745.11
Election Auditing	$1,030,541.46	$1,490,913.65	$1,954,390.50	$1,832,528.82	$6,308,374.43
Cyber Security	$76,321,134.86	$49,449,771.74	$45,412,122.79	$33,249,054.35	$204,432,083.74
Physical Security	-	-	-	$1,868,306.89	$1,868,306.89
Voter Education	$6,838,751.44	$7,561,927.88	$5,432,191.57	$3,694,007.57	$23,526,878.46
Accessibility	$2,443,677.60	$671,123.50	$1,720,753.52	$4,021,787.26	$8,857,341.88
Other	$931,755.82	$3,101,435.96	$8,660,613.53	$2,827,399.98	$15,521,205.29
Total	**$199,444,024.84**	**$199,117,669.34**	**$116,526,120.35**	**$100,634,634.00**	**$615,722,448.53**

Table D4. Percentage of Total Election Security Funds Spent by Category and Year, Based on Annual Progress Reports.

	2020	2021	2022	2023	Total
Voting Equipment	20.7%	27.0%	16.4%	23.9%	22.5%
Voting Processes	25.2%	32.1%	9.3%	7.3%	21.5%
Voter Registration Systems	10.2%	9.6%	20.1%	21.5%	13.7%
Election Auditing	0.5%	0.7%	1.7%	1.8%	1.0%
Cyber Security	38.3%	24.8%	39.0%	33.0%	33.2%
Physical Security	-	-	-	1.9%	0.3%
Voter Education	3.4%	3.8%	4.7%	3.7%	3.8%
Accessibility	1.2%	0.3%	1.5%	4.0%	1.4%
Other	**0.5%**	**1.6%**	**7.4%**	**2.8%**	**2.5%**

Table D5. Cumulative Election Security (ES) Grant Funds Received and Spent Nationwide, Based on States' Reported FFRs.

Year	Cumulative ES Funds Received by States	Cumulative ES Funds Spent by States	Unspent ES Funds	Cumulative ES Funds Authorized	Percentage of ES Grant Funds Spent
2018	$186,224,962.00	$5,435,197.74	$180,789,764.26	$365,032,488.02	2.9%
2019	$74,262,398.00	$20,129,866.42	$54,132,531.58	$365,181,288.02	27.1%
2020	$804,378,602.00	$214,286,674.01	$590,091,927.99	$804,378,602.00	26.6%
2021	$806,978,602.00	$385,474,187.19	$421,504,414.81	$806,978,602.00	47.8%
2022	$877,210,508.00	$476,824,338.20	$400,386,169.80	$877,210,508.00	54.4%
2023	$930,330,228.00	$528,048,658.17	$402,281,569.83	$930,330,228.00	56.8%

All data in the table above is based on reported data by states in their annual FFRs. The categories in the table correspond to the FFRs as follows:[7]

- **Cumulative ES Funds Received by States**: corresponds to FFR item "10a. Cash Receipts," which shows the cumulative amount of grant funding disbursed from the federal agency as of the reporting period end date.
- **Cumulative ES Funds Spent by States**: corresponds to FFR item "10b. Cash Disbursements," which shows the cumulative amount of federal fund disbursements as of the reporting period end date. Disbursements are the sum of actual cash disbursements for direct charges for goods and services, the amount of indirect expenses charged to the award, and the amount of cash advances and payments made to subrecipients and contractors.
- **Unspent ES Funds**: corresponds to FFR item "10c. Cash on Hand," which shows the amount of item 10a minus item 10b and represents immediate cash available to be expended.
- **Cumulative ES Funds Authorized**: corresponds to FFR item "10d. Total Federal Funds Authorized," which shows the total federal funds authorized for use by the state as of the reporting period end date.
- **Percentage of ES Grant Funds Spent**: corresponds to item "10b. Cash Disbursements" divided by item "10a. Cash Receipts."

7 Information on the contents of each item was obtained from https://www.eac.gov/sites/default/files/Grants/EAC%20Federal%20Financial%20Report%20(Reference%20Only).pdf.

Table D6. Total Number of Program Narratives Covering Each Main Topic, and Percentage of Main Topics Covered Overall and by Year.

Main Topic	Total	Overall Percentage	2018 Percentage	2020 Percentage	2022 Percentage
Voting Equipment and Processes	124	77.5%	83.6%	85.5%	62.0%
Voter Registration Systems	104	65.0%	63.6%	65.5%	66.0%
Cyber Security	118	73.8%	87.3%	70.9%	62.0%
Audits	44	27.5%	41.8%	25.5%	14.0%
Subgrants	28	17.5%	16.4%	25.5%	10.0%
Education	66	41.3%	41.8%	40.0%	42.0%
Training	93	58.1%	67.3%	63.6%	42.0%
Accessibility	34	21.3%	18.2%	23.6%	22.0%

Table D7. Total Number of Program Narratives Covering Each Subtopic, and Percentage of Main Subtopics Covered Overall and by Year When the Main Topic Was Discussed in the Narrative.

Main Topic	Subtopic	Total	Overall Pct.	2018 Pct.	2020 Pct.	2022 Pct.
Voting Equipment and Processes	Tabulators	22	17.7%	15.2%	25.5%	9.7%
	Ballot Marking Devices	14	11.3%	6.5%	14.9%	12.9%
	Upgraded System	71	57.3%	71.7%	51.1%	45.2%
	E-Poll Books	17	13.7%	15.2%	14.9%	9.7%
	Absentee Mail	15	12.1%	6.5%	19.1%	9.7%
	General Supplies	20	16.1%	13.0%	19.1%	16.1%
	Voting Accessibility Equipment	11	8.9%	4.3%	14.9%	6.5%
	Election Staffing	14	11.3%	15.2%	10.6%	6.5%
	Voting Process Enhancements	9	7.3%	8.7%	6.4%	6.5%
	Election Training	28	22.6%	21.7%	27.7%	16.1%
	Absentee Mail Voting Enhancements	8	6.5%	2.2%	12.8%	3.2%
	Cyber Physical Security	46	37.1%	30.4%	46.8%	32.3%
	Voting Accessibility Support	10	8.1%	6.5%	8.5%	9.7%

Main Topic	Subtopic	Total	Overall Pct.	2018 Pct.	2020 Pct.	2022 Pct.
Voter Registration Systems (VRS)	VRS Improvements	90	86.5%	88.6%	83.3%	87.9%
	VRS Maintenance	20	19.2%	20.0%	16.7%	21.2%
	VRS Security	36	34.6%	42.9%	33.3%	27.3%
Cyber Security	Training Exercises	63	53.4%	66.7%	56.4%	29.0%
	Monitoring Testing	58	49.2%	58.3%	51.3%	32.3%
	Physical Infrastructure	40	33.9%	31.3%	38.5%	32.3%
	Improvements	82	69.5%	75.0%	71.8%	58.1%
	Authentication	33	28.0%	35.4%	20.5%	25.8%
	Staffing	34	28.8%	37.5%	28.2%	16.1%
	Incident Preparedness	18	15.3%	14.6%	17.9%	12.9%
	Standard Compliance	10	8.5%	10.4%	10.3%	3.2%
Audits	Election Audit Performance	40	90.9%	91.3%	85.7%	100.0%
	Audit Software	8	18.2%	8.7%	35.7%	14.3%
Education	General Education	28	42.4%	39.1%	54.5%	33.3%
	Public Trust Outreach	16	24.2%	26.1%	18.2%	28.6%
	Election Official Training	37	56.1%	65.2%	59.1%	42.9%
	Misinformation	9	13.6%	0.0%	18.2%	23.8%
Accessibility	Physical Infrastructure	11	32.4%	50.0%	38.5%	9.1%
	Training	11	32.4%	20.0%	30.8%	45.5%
	Other	13	38.2%	40.0%	38.5%	36.4%
	Voting Accessibility Equipment	11	32.4%	20.0%	53.8%	18.2%
	Voting Accessibility Support	10	29.4%	30.0%	30.8%	27.3%
Training	Accessibility Training	11	11.8%	5.4%	11.4%	23.8%
	Election Official Training	37	39.8%	40.5%	37.1%	42.9%
	Cyber Security Training	63	67.7%	86.5%	62.9%	42.9%
	Election Training	28	30.1%	27.0%	37.1%	23.8%

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