OSET INSTITUTE
Briefing

Georgia State Election Technology Acquisition

A Reality Check

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With a Preface Comment By:
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Preface

Election technology infrastructure—America's digital process and platforms of democracy administration in the digital age—is a sector of critical infrastructure. Protecting the sovereign act of public elections is a matter of defending democracy. Therefore, the Institute believes the acquisition, implementation, operation, and protection of election and voting systems, services, and directly related technology is a matter of national security not to be taken lightly. Cyber-terrorism directed at disrupting our sovereignty — and the sovereignty of all democracies worldwide — compels pragmatic intellectual honesty about equipment acquisition. All parties to such transactions have an imperative duty to focus first on acquisitions that maximize security and integrity, lower costs for taxpayers, and ensure that elections conducted on such equipment are verifiable, accurate, secure and transparent in process.

When the Institute observes unusual deviation from this compelled practice, it must be called out and examined. The State of Georgia's current legislation and efforts to acquire new voting technology for the 2020 election is emerging as a one such case that cannot and should not be ignored. The Institute's Global Director of Technology Development, Edward Perez, himself a fifteen year veteran of the commercial voting and election administration technology industry, recently noted the extent to which the Georgia Secretary of State's Elections Division is proceeding to drive a specific acquisition that defies the logic and warnings of the super majority of computer scientists, election technology and security experts, and election integrity professionals. Why is that? Mr. Perez produced an analysis in the Briefing that suggests there is very good reason to ask. The analysis presented in the Briefing is very likely to also be useful for other jurisdictions around the nation, as it contains relevant price estimates for voting technology available in the marketplace today, as well as a repeatable methodology that can be used by election officials and stakeholders in other states.

Overview

At the outset, it is important to contextualize Edward Perez's work in preparing this Briefing given his highly relevant credentials. Mr. Perez has deep experience in precisely the type of complex financial modeling required for voting system solutions. As a former Director of Product Management and also Manager of Professional Services for one of the three major commercial vendors, Mr. Perez regularly provided support for Request For Proposal (RFP) responses for major procurements of election technology, which required a strong understanding of solution architecture, contractual terms and requirements, and industry-standard terminology and practices. Moreover, Mr. Perez has and continues to perform competitive intelligence research, which has enabled him to become very familiar with product features, pricing, and service practices associated with all of the major vendors. In sum, he is uniquely qualified to provide a pragmatic, and intellectually honest analysis of what a statewide implementation for voting technology requires.

It is equally important to note the Institute has no stake in the outcomes in Georgia, other than exercising its mission to help ensure the public interest in this decision that will materially affect the integrity of Georgia elections, and therefore inevitably affect national election.

As is the case with virtually any cost analysis, estimates are just that: estimates. However, all information provided herein is based on publicly available data. The Institute makes no specific claims or representation about any specific voting system or vendor.

The objective is to provide a comparison of estimated costs to implement a hand-marked paper ballot system, with only a select number of accessible ballot marking devices for voters with disabilities (hereinafter, a "HMPB" system), versus an all Ballot Marking Device system (hereinafter, "BMD"), based on factual evidence and working assumptions that can be clearly and transparently presented. Others, especially opponents of this analysis, will quibble with some of the assumptions, as is typical in all estimation exercises; however, the Institute is confident that this information can nevertheless advance the dialogue by providing a more complete good-faith picture of costs than has been previously available from other sources.

Situational Analysis

The Institute appreciates that there are a couple of principal means for evaluating alternative bids in an RFP process: Least Cost Method ("LCM") and Value Based Assessment ("VBA"). The former is a more objective measure of effective taxpayer dollar spending, while the latter can introduce some subjectivity, although the Institute argues that even in VBA metrics can be applied to minimize subjectivity. The analysis in this Briefing is based on costs because that is the basis the State of Georgia has used to make its case for the system of its choice, and without more explanation from the State, the numbers presented do not appear to be transparently presenting to Georgia taxpayers the entire story in our professional opinion.

At the time of this writing, the Georgia Legislature is currently considering HB 316, which contains provisions (among others) for a statewide voting system using electronic ballot marking devices (BMDs) for all voters. HB 316 has already passed the Georgia House of Representatives, and will be considered next on the floor of the Georgia Senate.

The distinction between HMPB systems versus all-BMD voting systems has become central to the still-developing Georgia story. On February 26, 2019, the Georgia Secretary of State (SOS) Elections Division took the unusual step of proactively posting on its official government web site the results of a claimed "*comprehensive inquiry into the cost of implementing a hand-marked paper ballot system for the State of Georgia*."

The internal inquiry, conducted by Georgia Director of Elections, unfortunately raises questions about its methodology and conclusions. Based on over 15-years' experience with the procurement analyses of election technology, the author of this Briefing observes that the GA State Secretary's two-page memo appears to contain incomplete information to estimate costs, as well as questionable assumptions about printing paper ballots. Most importantly, the memo is completely silent on costs associated with an all-BMD implementation, and makes no effort to compare those costs with an implementation that combines hand-marked paper ballots with a select number of accessible ballot marking devices for voters with disabilities.

With this information as background, the OSET Institute presents a detailed analysis and total cost estimate for the State of Georgia to acquire and use a HMPB system versus an all-BMD system over a period of 10 years. This analysis includes two models for HMPB systems: "moderate" ballot printing, and "high" ballot printing, in addition to the costs associated with an all-BMD implementation.

The OSET Institute analysis concludes that over a 10-year period, both the "moderate" and "high" printing models associated with the implementation of a HMPB system are *less costly* than an all-BMD implementation.

The analysis is based on a detailed summation of costs associated with hardware, software, project management, training, installation, annual maintenance and license fees, and consumables such as paper ballots and thermal-print summary cards. In this Briefing we provide the summary, with an Appendix containing the models, assumptions, and a copy of the GA Director Elections Memo.

The Georgia Director of Elections Memo

In February 2019, the Georgia Director of Elections wrote to State Secretary Brad Raffensperger,

> *"Some in the legislature have advocated for a Hand Marked Paper Ballot solution for our new statewide, uniform system. As part of our due diligence, your staff has worked to analyze available data to ascertain the costs of implementing such a solution."*

The OSET Institute makes the following observations about this memo:

1. The memo selectively *includes* costs seemingly unrelated to the voting system purchase, without explanation. For example, the cost summary includes $9.6 million associated with electronic poll books, which are strictly speaking separate from a voting system purchase. Furthermore, a line-item cost associated with poll books would *also* be applicable to an all-BMD implementation. It is unclear why this line item is included in the cost table for a HMPB voting system implementation.

2. Meanwhile, the memo also selectively *excludes* important costs. The memo acknowledges, for example, that the cost table does not include annual maintenance fees and license fees, which would be significantly less costly in a HMPB implementation, and significantly more costly in an all-BMD solution, by virtue of the relatively low and high number of devices, respectively. It is unclear why the memo is silent on this point.

3. The memo does not explain why the Director of Elections has assumed $0.55 per pre-printed ballot, nor the comment that *"$0.55 is believed by our office to likely be on the low side."* Here is settled knowledge on this point: The per-unit cost of pre-printed ballots usually reflects a bundled combination of "raw" printing costs (*i.e., paper and printing press*) plus, in many cases, the cost of vendor ballot programming services to input data and produce the ballot layout. To cite an example, one major vendor indicates that the base printing rate for 14 inch to 17 inch ballots is $0.21 each, plus $0.02 for folding.[1] Accounting for the cost of ballot programming services in addition to printing, the Institute's analysis, again, based on experience, estimates a base rate closer to $0.40 per printed ballot.

4. It appears unrealistic for the Director of Elections to assume that for statewide elections, over *8.5 million ballots* (*i.e., 120% of the assumed 7.1 million registered voters*) would be printed for *each* ballot style, for *each* election. Using these assumptions, the Director of Elections forecasts that a total of *25.56 million ballots* (8.52 million ballots x 3 ballot styles) would need to be pre-printed to support statewide primary elections that have historically totaled approximately *1 million to 1.3 million ballots cast*. This 20x multiplier is only one glaring example of how questionable assumptions about ballot printing costs unduly and incredibly inflate the Director's estimates. For purposes of the Institute's analysis, we have, relying on direct experience, made more realistic assumptions based on historical turnout, [2] *including* upward adjustments to account for voter registration growth and ballot spoilage.

5. The Elections Division memo also *excludes* comparisons with the estimated costs for an all-BMD implementation. From direct experience, the author of this Briefing asserts that a BMD based system incurs significantly higher costs for acceptance testing, installation, hardware maintenance, and software licensing fees due to vastly higher numbers of voting devices (30,500 total in an all-BMD implementation, versus 8,230 in a HMPB implementation). This oversight alone deserves more scrutiny.

The Institute's Approach

The OSET Institute developed cost estimation summaries for different system implementations based on industry-standard terms and practices. More specifically, the conclusion on the next page and the Appendix reflect a summation of the following elements:

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[1] See p. 19, www.jeffcomo.org/uploads/Purchasing/Invitation%20for%20Bid%202017/Bid%20Tabulation/BID%20TABULATION%20-%20ELECTION%20VOTING%20TABULATION%20EQUIPMENT.pdf

[2] Georgia Secretary of State, Current and Past Election Results, sos.ga.gov/index.php/Elections/current_and_past_elections_results/

1. Year 1 fees associated with acquisition of hardware and software, implementation services, and first-use Election Day support
2. Years 2 through 10 fees associated with ongoing maintenance and license fees; and
3. Years 2 through 10 costs associated with consumables such as ballot printing, or use of thermal paper to print "summary cards" from BMDs

To populate this model, the Institute made some necessary assumptions:

- The same quantities of devices used in Election Director's memo, wherever applicable;
- Hardware, software and services similar to those specified in a major vendor's response to the Georgia SAFE Commission Request for Information (RFI), dated August 24, 2018;[3] and
- Turnout in accordance with State of Georgia historical records for total ballots cast in various types of statewide elections.

Furthermore, two models were run for the HMPB implementation:

- A "moderate" model, assuming numbers of ballots cast based on historical records, and
- A "high" model, to exercise the most extreme limits of ballot printing, which would, in turn, result in the highest estimate for a HMPB ballot implementation.

Important Note: The HMPB "high" model is not realistic, as it assumes 25 million ballots printed for general primary elections that have historically garnered approximately 1.3 million ballots cast. The purpose of including the "high" model was to test whether the cost of even the most demanding HMPB implementation would exceed the cost of an all-BMD implementation.

All of the OSET Institute's assumptions are completely identified in *Assumptions and References*, in the Appendix. All data provided herein is based on publicly available information, and the Institute makes no specific claims or representation about any specific voting system or vendor.

Conclusion – Estimated 10-Year Costs

HMPB implementation with "moderate" ballot printing:.....$112,672,986

HMPB implementation with "high" ballot printing:..... $181,762,986

All-BMD implementation with on-demand thermal card printing: $203,296,732

[3] Election Systems & Software, *Response to State of Georgia Electronic Request for Information, New Voting System*, Event Number 47800-SOS0000035, August 24, 2018.

Appendix

Assumptions & References

HMPB Implementation Device Quantities

- 3,500 polling place scanners based on GA SOS quantities
- 4,730 BMDs for ADA-only based on GA SOS quantities
- 163 central scanners (for absentee processing) based on GA SOS quantities
- 163 EMS software licenses based on GA SOS quantities

All-BMD Implementation Device Quantities

- 27,000 BMDs based on Georgia SAFE Commission RFI (27,000 DREs currently)
- 3,500 polling place scanners based on GA SOS quantities
- 163 central scanners (for absentee processing) based on GA SOS quantities
- 163 EMS software licenses based on GA SOS quantities

Items Common to All Voting Models

- All voting device prices reflect list pricing, without discounts. (Note: Discounts are common in the voting technology industry, and the OSET Institute estimates that with discounts, polling place scanners might be approximately $5,500 each, and ballot marking devices might be approximately $3,000 each.)
- Project management & training based on industry estimates.
- The following items are based on a publicly-available major vendor's response to *State of Georgia Electronic Request for Information, New Voting System*, Event Number 47800-SOS0000035, August 24, 2018.
    - Hardware installation fees
    - Onsite support fees
    - Polling place scanner maintenance
    - BMD maintenance
    - Central scanner maintenance
    - Polling place software license fee
    - BMD software license fee
    - Central scanner software license fee
    - EMS software license fee
- License fees increase annually, as is the common industry practice. The percentage is based on "*not to exceed*" industry estimates.

Ballot Printing Costs

- Unit costs are based on industry pricing starting at $0.20 per sheet, plus additional cost for vendor ballot programming services (i.e. data input, ballot layout, etc.).
- Ballot printing costs increase over the 10-year period to reflect inflation.
- "Moderate" HMPB ballot printing estimates are based on generous upward adjustments from Georgia statewide historical results of total ballots cast, including voter registration growth between election cycles.
- "High" HMPB estimates are based on printing for 120% of 7.1 million registered voters, for every election, with x2 for Presidential Preference Primaries, and x3 for General Primary elections. (Note: Historical records for total ballots cast are actually far less than the calculated numbers of ballots printed.)
- Ballot printing costs are based on regular election cycles only, as runoff elections are difficult to predict and have historically generated relatively low numbers of total ballots cast.

BMD Thermal Cards

- Thermal card stock is available in lengths from 11" long to 19" long, and the per card price ranges from $0.09 for 11" to $0.12 for 11". To accommodate a variety of ballot styles across different elections, ranging from short to long, this analysis assumes $0.10 per card.
- Thermal card prices increase over the 10-year period to reflect inflation.
- Numbers of cards printed in each election assumes voter registration growth between election cycles.
- Unlike pre-printed ballots, on-demand printing assumes lower spoilage rates.

References

1. Election Systems & Software, *Response to State of Georgia Electronic Request for Information, New Voting System*, Event Number 47800-SOS0000035, August 24, 2018.
2. Georgia Secretary of State, *Current and Past Election Results*, http://sos.ga.gov/index.php/Elections/current_and_past_elections_results
3. Harvey, Chris (Georgia Director of Elections), Memorandum to Brad Raffensperger, (Georgia Secretary of State), *Statewide Voting System Pre-Printed Hand-Marked Ballot Solution*, February 25, 2019

Estimate No. 1: HMB Moderate

Hand-marked paper ballots (optical scan + ballot marking devices for ADA only)

Moderate Printing Estimate

Year 1 Hardware, Software, Support

Line Items	Quantity	Unit Cost	Total Cost
Polling place scanner	3,500	$5,800	$20,300,000
Ballot marking device (for ADA only)	4,730	$3,500	$16,555,000
Central scanning device	163	$40,000	$6,520,000
Election Management Software (EMS) - counties	163	$30,000	$4,890,000
Election Management Software (EMS) - state	1	$50,000	$50,000
Hardware installation for polling place scanners	3,500	$115	$402,500
Hardware installation for ADA BMDs	4,730	$105	$496,650
Hardware installation for central scanners	163	$1,000	$163,000
EMS installation	163	$2,250	$366,750
Proj mgmt., acceptance and training days	200	$1,700	$340,000
Onsite support for Election Day	163	$4,700	$766,100
TOTAL - Year 1 Hardware, Software, Support			**$50,850,000**

Annual maintenance and software license fees - Year 2

Line Items	Quantity	Unit Cost	Total Cost
Polling place scanner maintenance	3,500	$110	$385,000
BMD maintenance	4,730	$75	$354,750
Central scanner maintenance	163	$1,900	$309,700
Polling place scanner SW license fee	3,500	$80	$280,000
BMD SW license fee	4,730	$65	$307,450
Central scanner SW license fee	163	$1,575	$256,725
EMS SW license fee - counties	163	$8,000	$1,304,000
EMS SW license fee - state	1	$50,000	$50,000
TOTAL - Year 2 Maintenance and License Fees			$3,247,625
Year 3 Maintenance and License Fees @3.5% annual increase			$3,361,292
Year 4 Maintenance and License Fees @3.5% annual increase			$3,478,937
Year 5 Maintenance and License Fees @3.5% annual increase			$3,600,700
Year 6 Maintenance and License Fees @3.5% annual increase			$3,726,724
Year 7 Maintenance and License Fees @3.5% annual increase			$3,857,160
Year 8 Maintenance and License Fees @3.5% annual increase			$3,992,160
Year 9 Maintenance and License Fees @3.5% annual increase			$4,131,886
Year 10 Maintenance and License Fees @3.5% annual increase			$4,276,502
TOTAL - Years 2 thru 10 Maintenance and License Fees			**$33,672,986**

Consumable Costs - Ballot Printing - MODERATE, based on upward adjustments from historical ballots cast

Election	Ballots Printed	Unit Cost	Total Cost
2020 Presidential Preference Primary (Mar)	3,500,000	$0.40	$1,400,000
2020 General Primary (May)	2,500,000	$0.40	$1,000,000
2020 Presidential General (Nov)	6,500,000	$0.40	$2,600,000
2022 General Primary (May)	3,000,000	$0.42	$1,260,000
2022 General (Nov)	6,000,000	$0.42	$2,520,000
2024 Presidential Preference Primary (Mar)	4,000,000	$0.44	$1,760,000
2024 General Primary (May)	3,500,000	$0.44	$1,540,000
2024 Presidential General (Nov)	7,000,000	$0.44	$3,080,000
2026 General Primary (May)	4,000,000	$0.46	$1,840,000
2026 General (Nov)	6,500,000	$0.46	$2,990,000
2028 Presidential Preference Primary (Mar)	4,500,000	$0.48	$2,160,000
2028 General Primary (May)	4,500,000	$0.48	$2,160,000
2028 Presidential General (Nov)	8,000,000	$0.48	$3,840,000
TOTAL - Ballot Printing Costs			**$28,150,000**

GRAND TOTAL - HMPB MODERATE COST OVER 10 YEARS **$112,672,986**

Year 1 HW, SW, Support + Year 2-10 Maintenance and License + Ballot Printing

** Storage and transportation costs are **not** included for 3,500 scanners and 4,730 BMDs*

Estimate No. 2: HMB High

Hand-marked paper ballots (optical scan + ballot marking devices for ADA only)

High Printing Estimate

Year 1 Hardware, Software, Support

Line Items	Quantity	Unit Cost	Total Cost
Polling place scanner	3,500	$5,800	$20,300,000
Ballot marking device (for ADA only)	4,730	$3,500	$16,555,000
Central scanning device	163	$40,000	$6,520,000
Election Management Software (EMS) - counties	163	$30,000	$4,890,000
Election Management Software (EMS) - state	1	$50,000	$50,000
Hardware installation for polling place scanners	3,500	$115	$402,500
Hardware installation for ADA BMDs	4,730	$105	$496,650
Hardware installation for central scanners	163	$1,000	$163,000
EMS installation	163	$2,250	$366,750
Proj mgmt., acceptance and training days	200	$1,700	$340,000
Onsite support for Election Day	163	$4,700	$766,100
TOTAL - Year 1 Hardware, Software, Support			**$50,850,000**

Annual maintenance and software license fees - Year 2

Line Items	Quantity	Unit Cost	Total Cost
Polling place scanner maintenance	3,500	$110	$385,000
BMD maintenance	4,730	$75	$354,750
Central scanner maintenance	163	$1,900	$309,700
Polling place scanner SW license fee	3,500	$80	$280,000
BMD SW license fee	4,730	$65	$307,450
Central scanner SW license fee	163	$1,575	$256,725
EMS SW license fee - counties	163	$8,000	$1,304,000
EMS SW license fee - state	1	$50,000	$50,000
TOTAL - Year 2 Maintenance and License Fees			$3,247,625
Year 3 Maintenance and License Fees @3.5% annual increase			$3,361,292
Year 4 Maintenance and License Fees @3.5% annual increase			$3,478,937
Year 5 Maintenance and License Fees @3.5% annual increase			$3,600,700
Year 6 Maintenance and License Fees @3.5% annual increase			$3,726,724
Year 7 Maintenance and License Fees @3.5% annual increase			$3,857,160
Year 8 Maintenance and License Fees @3.5% annual increase			$3,992,160
Year 9 Maintenance and License Fees @3.5% annual increase			$4,131,886
Year 10 Maintenance and License Fees @3.5% annual increase			$4,276,502
TOTAL - Years 2 thru 10 Maintenance and License Fees			**$33,672,986**

Consumable Costs - Ballot Printing - HIGH, based on printing for 120% of 7.1M voters

Election	Ballots Printed	Unit Cost	Total Cost
2020 Presidential Preference Primary (Mar)	17,000,000	$0.40	$6,800,000
2020 General Primary (May)	25,500,000	$0.40	$10,200,000
2020 Presidential General (Nov)	8,500,000	$0.40	$3,400,000
2022 General Primary (May)	25,500,000	$0.42	$10,710,000
2022 General (Nov)	8,500,000	$0.42	$3,570,000
2024 Presidential Preference Primary (Mar)	17,000,000	$0.44	$7,480,000
2024 General Primary (May)	25,500,000	$0.44	$11,220,000
2024 Presidential General (Nov)	8,500,000	$0.44	$3,740,000
2026 General Primary (May)	25,500,000	$0.46	$11,730,000
2026 General (Nov)	8,500,000	$0.46	$3,910,000
2028 Presidential Preference Primary (Mar)	17,000,000	$0.48	$8,160,000
2028 General Primary (May)	25,500,000	$0.48	$12,240,000
2028 Presidential General (Nov)	8,500,000	$0.48	$4,080,000
TOTAL - Ballot Printing Costs			**$97,240,000**

GRAND TOTAL - HMPB HIGH COST OVER 10 YEARS **$181,762,986**

Year 1 HW, SW, Support + Year 2-10 Maintenance and License + Ballot Printing

** Storage and transportation costs are **not** included for 3,500 scanners and 4,730 BMDs*

Estimate No. 3: All BMD

Touchscreen ballot marking devices (BMDs) for all voters

First Year Hardware and Software

Line Items	Quantity	Unit Cost	Total Cost
Polling place scanner	3,500	$5,800	$20,300,000
Ballot marking device (for all voters)	27,000	$3,500	$94,500,000
Central scanning device	163	$40,000	$6,520,000
Election Management Software (EMS) - counties	163	$30,000	$4,890,000
Election Management Software (EMS) - state	1	$50,000	$50,000
Hardware install for polling place scanners	3,500	$115	$402,500
Hardware installation for ADA BMDs	27,000	$105	$2,835,000
Hardware installation for central scanners	163	$1,000	$163,000
EMS installation	163	$2,250	$366,750
Proj mgmt., acceptance and training days	400	$1,700	$680,000
Onsite support for Election Day	163	$4,700	$766,100
TOTAL - Year 1 Hardware, Software, Support			**$131,473,350**

Annual maintenance and software license fees - Year 2

Line Items	Quantity	Unit Cost	Total Cost
Polling place scanner maintenance	3,500	$110	$385,000
BMD maintenance	27,000	$75	$2,025,000
Central scanner maintenance	163	$1,900	$309,700
Polling place scanner SW license fee	3,500	$80	$280,000
BMD SW license fee	27,000	$65	$1,755,000
Central scanner SW license fee	163	$1,575	$256,725
EMS SW license fee - counties	163	$8,000	$1,304,000
EMS SW license fee - state	1	$50,000	$50,000
TOTAL - Year 2 Maintenance and License Fees			$6,365,425
Year 3 Maintenance and License Fees @3.5% annual increase			$6,588,215
Year 4 Maintenance and License Fees @3.5% annual increase			$6,818,802
Year 5 Maintenance and License Fees @3.5% annual increase			$7,057,460
Year 6 Maintenance and License Fees @3.5% annual increase			$7,304,472
Year 7 Maintenance and License Fees @3.5% annual increase			$7,560,128
Year 8 Maintenance and License Fees @3.5% annual increase			$7,824,733
Year 9 Maintenance and License Fees @3.5% annual increase			$8,098,598
Year 10 Maintenance and License Fees @3.5% annual increase			$8,382,049
TOTAL - Years 2 thru 10 Maintenance and License Fees			**$65,999,882**

Consumable costs - On-Demand Thermal Card Printing for BMD devices

Election	Cards printed	Unit Cost	Total Cost
2020 Presidential Preference Primary (Mar)	2,100,000	$0.10	$210,000
2020 General Primary (May)	900,000	$0.10	$90,000
2020 Presidential General (Nov)	5,000,000	$0.10	$500,000
2022 General Primary (May)	1,200,000	$0.12	$144,000
2022 General (Nov)	4,400,000	$0.12	$528,000
2024 Presidential Preference Primary (Mar)	2,400,000	$0.14	$336,000
2024 General Primary (May)	1,400,000	$0.14	$196,000
2024 Presidential General (Nov)	5,625,000	$0.14	$787,500
2026 General Primary (May)	1,575,000	$0.16	$252,000
2026 General (Nov)	5,000,000	$0.16	$800,000
2028 Presidential Preference Primary (Mar)	2,700,000	$0.18	$486,000
2028 General Primary (May)	1,800,000	$0.18	$324,000
2028 Presidential General (Nov)	6,500,000	$0.18	$1,170,000
TOTAL - Thermal Card Printing Costs			**$5,823,500**

GRAND TOTAL - ALL-BMD COST OVER 10 YEARS **$203,296,732**

Year 1 HW, SW, Support + Year 2-10 Maintenance and License + On-Demand Thermal Card Printing

** Storage and transportation costs are **not** included for 27,000 BMDs and 3,500 scanners*

Exhibit 1: Georgia State Director of Elections Memo

Memo

To: Brad Raffensperger, Secretary of State

From: Chris Harvey

cc: Jordan Fuchs, Deputy Secretary of State

Date: 2/25/2019

Re: Statewide Voting System Pre-printed Hand-Marked Ballot Solution

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Some in the legislature have advocated for a Hand Marked Paper Ballot solution for our new statewide, uniform system. As part of our due diligence, your staff has worked to analyze available data to ascertain the costs of implementing such a solution.

Initial Costs

Any solution will require uniform equipment and machinery in all 159 counties and 2365 precincts to actually run any election.

Here is the list of necessary equipment and initial cost attached to it.

Device	Units	Unit Cost Low	Unit Cost High	Total Cost Low	Total Cost High
ePoll Book	8,000	$1,000	$1,200	$8,000,000	$9,600,000
Polling Place Scanner	3,500	$4,000	$6,000	$14,000,000	$21,000,000
Central Scanning Device	163	$30,000	$50,000	$4,890,000	$8,150,000
Ballot Marking Device (for ADA Compliance)	4,730	$3,500	$4,500	$16,555,000	$21,285,000
Total Initial Equipment Costs				**$43,445,000**	**$60,035,000**

Keep in mind this is initial purchase costs only. There is no allowance for implementation, training, warranties, maintenance, security, election management software integration, election reporting software integration, etc.

Paper Costs

The ongoing costs of pre-printing ballots to be hand-marked by voters is a variable cost. We made some assumptions to compare apples to apples for a statewide implementation.

First, we estimate $0.55 per ballot for the costs of pre-printing ballots. This cost will vary among our 159 counties. The $0.55 is believed by our office to likely be on the low side.

Second, not being able to know the potential outcomes of elections, we can not know how many runoffs we will see locally or statewide. Also, we do not include any other elections in the analysis such as special elections, municipal, SPLOST, etc. We just know there will be many over a 10-year period.

Third, we assume static population change. So for this analysis, we are settling on 7,100,000 voters. However, we are aware that there will be over one million new voters over the next ten years.

Fourth, for this cost of pre-printed ballot analysis we focused on the statewide elections over a 10-year period. When doing pre-printed ballots, we have to print a potential ballot for every active registered voter and print extra to account for Advanced Voting, Provisional Voting and Ballot Spoilage. That additional number normally runs about 20%. Also, for Primaries, there have to three types of ballots printed; Democratic, Non-Partisan, and Republican.

Type of Election	**# of Types of Ballots**	**Anticipated # of Elections**	**# of Ballots Printed Total**	**Total Cost over 10 years**
Presidential Preference Primaries	2	2	34,080,000	$18,744,000
Primaries	3	5	127,800,000	$70,290,000
Primary Runoffs	3	3	76,680,000	$42,174,000
Generals	1	5	42,600,000	$23,430,000
General Runoffs	1	2	17,040,000	$9,372,000
Total 10-year Print Costs				**$164,010,000**

These print costs are exclusively borne by the counties running the elections.

Conclusion

The low-end cost of equipment and printing is $207,455,000 and on the high-end cost is $224,045,000. It should be noted that these costs for printing will fall to the counties. Further, executing such a solution will be logistically difficult and expensive for the counties to bear.

