Florida Fair Elections Coalition
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Assessing Voting System Accuracy

A Comparison of Voting System Performance Using Undervote Rates in Statewide Races in Florida's 2006 General Election

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INTRODUCTION

After Florida's 2000 election debacle, the state legislature mandated that the Florida Division of Elections produce a report on overvotes and undervotes in the top race on the ballot after each statewide general election. The stated goal was to monitor the performance of the state's voting systems and the efficacy of its election management procedures in order to prevent future election meltdowns.[1]

Residual votes—undervotes, overvotes, and illegal write-ins—have long been considered a good indicator of election accuracy so producing such a report made sense. Unfortunately, the reality has not lived up to its promise. The report's severely limited scope and lack of investigative rigor have meant that many problems have gone undetected. For example, the excessive undervote rate in the attorney general's race in 2006 didn't even merit a mention. The highly visible undervote problem in Sarasota's Congressional District 13 race received only slight attention, with no research or analysis. Even when problems have been found, there has been no express mechanism for follow-up research or even for communicating the findings to the counties or voting machine vendors. Perhaps the problem lies in the inherent conflict of interest. The agency tasked with producing the report also certifies the voting systems and manages the election; thus, it has a strong interest in not finding any problems that cannot be attributed to voter error.[2]

In this paper, we take on the mandate of the state report—that is, we compare undervote rates in the top-of-the-ballot statewide races across voting systems to produce a comparative assessment of how Florida's five certified voting systems performed in the 2006 general election.[3]

We know from our previous research that the ES&S iVotronics, a touchscreen-based system without a paper record, performed very badly.[4] Numerous power and screen problems, along with other maintenance and performance issues contributed to higher undervote rates in several races, including the most costly election debacle in Florida history, the Sarasota CD-13

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[1] Kurt Browning, "Analysis and Report of Overvotes and Undervotes for the 2006 General Election," January 31, 2007, Florida Department of State, Tallahassee, FL.
In 2002, it became clear that the legislature had not considered the problems caused when the top race on the ballot is not the same statewide. Federal races appear before state races; therefore, in most counties, the U.S. House of Representatives race was the first contest on the ballot. In some counties, however, the race did not appear on the ballot because there was only one candidate. Under Florida law, in that case, the candidate is automatically elected and the race is omitted from the ballot. Thus, the first race on the ballot was not comparable across counties. Further, even in those cases where the seat was contested, the races had entirely dynamics that made comparisons difficult and unreliable. In the 2002 report, the state looked at both U.S. House races and the Governor's race.

[2] Another problem with the state report is that so far it has been produced by different members of in-house staff at the state division of elections—none of whom have any obvious credentials or experience in the area of data analysis. Clearly, it would be better to hire an objective, qualified outside entity to perform the data analysis and ensure that comparable data and methods are used for each report.

[3] A detailed discussion of our approach, methodology, and sources is included as Appendix A to this paper.

[4] Lost Votes and Vanishing Votes reference here.

race. Even worse undervote rates were experienced by some iVotronics counties in the state Attorney General's race. Our research also found higher-than-expected undervote rates in the U.S. Senate race. In all instances, the excessive undervotes in these counties were experienced solely on the iVotronic DRE, not on their optically scanned absentee ballots.

The state overvote and undervote report did mention elevated levels of undervotes on optically scanned absentee ballots in the ES&S Op-Tech blended counties, which it called a "curiosity." In fact, the report took the unusual step of calculating undervote rates for the optical scan systems, both with and without the ES&S Op-Tech absentee ballot data. Since the report stated that the problem was confined to absentee ballots in the ES&S Op-Tech counties—what would seem to be the very definition of a systemwide performance problem—it struck us as odd that the report did not follow up on this problem. Thus, this paper will attempt to examine the extent of this problem to determine if it involved a systemic failure.

Aside from what we can learn about the performance of particular systems, this assessment will also allow us to produce a baseline against which to measure future performance. This is particularly important since the 2006 election was the last time that Florida counties used the DRE (direct recording electronic) systems in a federal election. Partly because of the poor performance of the ES&S DREs in 2006, legislation was passed in 2007 to mandate paper-based optical scan voting systems across the state and eliminate touchscreen-based voting systems.[5] Therefore, our assessment of voting system performance in 2006 will allow us to produce a valid and interesting comparison of how the new systems compare to the old in terms of residual votes.

While Florida and many other states are no longer using DREs, except for disabled accessibility, these systems continue to be used in other states. We hope this analysis will help state and county legislators, election officials, and election integrity activists across the nation make more informed decisions about the acquisition of new voting systems.

[5] Touchscreens will continue to certified for use by disabled voters until 2012.

SUMMARY OF FINDINGS

OVERVIEW

Our investigation found serious equipment-related performance problems with two of Florida's five certified voting systems—the ES&S iVotronics and the ES&S Op-Tech systems. In the ES&S iVotronics system the problem was solely with the iVotronics DREs (Direct Recording Electronics, sometimes called touchsceens), which performed poorly across all top statewide races and in ten of the eleven counties in which it was used. This poor performance led to a huge loss of votes statewide—our estimate is that more 210,000 votes cast on the iVotronics were lost that would have counted if they had been cast on a different system.

In contrast, we found that the problem with high undervote rates on absentee ballots in the ES&S Op-Tech system was attributable to Orange County's high-speed absentee ballot scanner, which apparently has been losing votes at least since 2000. The alleged cause of the problem is the failure of the machine to be calibrated properly to read low carbon-based inks, i.e., gel inks. Yet other counties using the machine did not have the same problem even though all the ones we contacted had no idea that they should calibrate the machines to read these inks. In fact, when Orange County is removed from the calculation, the ES&S Op-Tech counties summary undervote rate becomes the best in the state at less than 2.3 percent. Further investigation showed that the Op-Tech scanner used with the Sequoia system is essential the same as the one used in Orange County, and no problems were found with excessive undervotes were found in those four counties either.

Judged by their undervote rates, the Diebold and the ES&S blended systems were the best-performing systems in the state. The two systems had nearly identical undervote rates—with the ES&S system performing slightly better. The ES&S system, however, only served a small number of Florida voters; in contrast, the Diebold system was used by more Florida counties than any other system and was second only to the iVotronics in the number of voters served. Thus, its relatively good performance had a more substantial effect on overall statewide undervoting.

Assessing the performance of the Sequoia AVC Edge was more difficult. With the second-highest undervote rate in the state, the system consistently performed more poorly than the optical scan systems; still, it did far better than the iVotronics. Unlike the iVotronics, the Sequoia system had no obvious disparity in undervote rates based on whether voters used the DRE or voted on optically scanned absentee ballots; furthermore, one of four counties using the system—Palm Beach—had relatively low undervote rates. We want to note, however, that the high-speed scanner used by this system—the Op-Tech 400-C—is reportedly nearly identical to the Op-Tech IV-C, which lost votes in Orange County because of problems reading gel inks. The higher undervote rates on the Sequoia system appear to be due to marginally higher undervote rates on all ballots—whether cast on the DREs or on paper. Thus, at this point, we cannot conclusively attribute high undervote rates in the Sequoia counties to poor voting system performance, rather than other possible causes, such as election management deficiencies.

RANKINGS

Based on cumulative undervote rates in top statewide races, relative rankings for Florida's five certified voting systems, from best to worst, were as follows:

Table 1. Florida Voting Systems Ranked by Performance, Florida's 2006 General Election (including Orange County)

Ranking	Voting System	Type	Undervote Rate
1 of 5	ES&S Blended	Optical scan	2.4%
2 of 5	Diebold Blended	Optical scan	2.5%
3 of 5	ES&S Op-Tech Blended	Optical scan	2.6%
4 of 5	Sequoia AVC Edge	Touchscreen	2.8%
5 of 5	ES&S iVotronics	Touchscreen	4.9%

Table 2. Florida Voting Systems Ranked by Performance, Florida's 2006 General Election (excluding Orange County)

Ranking	Voting System	Type	Undervote Rate
1 of 5	ES&S Op-Tech	Optical scan	2.3%
2 of 5	ES&S Blended	Optical scan	2.4%
3 of 5	Diebold Blended	Optical scan	2.5%
4 of 5	Sequoia AVC Edge	Touchscreen	2.8%
5 of 5	ES&S iVotronics	Touchscreen	4.9%

Touchscreen vs. optical scanners

- Relative to Florida's other certified voting systems, Florida's two touchscreen systems—the ES&S iVotronics and the Sequoia AVC Edge—ranked last and next to last respectively for their ability to count voters' choices accurately.

- The state's optical scan systems not only performed better than the touchscreen systems, but had similar undervote rates that varied little by vendor or mode of voting.[6]

SPECIFIC FINDINGS BY VOTING SYSTEM

#5. ES&S iVotronic Voting System

- In Florida's 2006 general election, the voting system used by more Florida voters than any other—the ES&S iVotronics—had by far the worst overall election accuracy performance of the five certified Florida voting systems. In fact, its rate was nearly double that of the state's two best performing systems.

- The ES&S iVotronics' poor performance overall was not due solely to excessive undervotes in a single race. Rather it performed poorly across all five of the top statewide races.

[6] This is true for the ES&S Op-Tech counties once Orange County is removed from the calculation.

- The ES&S iVotronics poor performance was not only consistent across races, but across counties, with ten of the eleven iVotronic counties experiencing elevated undervote rates in at least one top statewide race.

- The excessive undervotes on this system were experienced solely on the iVotronics DRE . In contrast, undervote rates on absentee ballots were generally in line with those in counties using other voting systems.

- The ES&S iVotronic's poor performance resulted in a very significant loss of votes in the top statewide races. Using a measure of excess undervotes based on relative performance, we estimate more than 210,000 votes were lost that would have been counted if they had been cast on a different system.

- While about a third of the state's population voted on the iVotronics voting system, it was responsible for nearly 80 percent of excess undervotes, according to our simple measure.

#4. Sequoia AVC Edge

- At 2.8 percent, the undervote rate on the Sequoia touchscreen voting system was significantly worse than the rates on the state's three optical scan systems (from 21% to 12% higher). Yet this rate was much better than the 4.9% summary undervote rate on the iVotronics (which is a full 75% higher).

- Unlike the iVotronics system, undervote rates did not vary much by mode of voting; thus no particular piece of equipment was obviously implicated.[7] This is particularly interesting given that its absentee ballot scanner—the Op-Tech 400---is essentially the same as the Op-Tech IV-C used in Orange County, which is acknowledged to have failed to count legitimately cast ballots marked with gel ink pens.

- With only four counties using the Sequoia system, it is more difficult to extricate the effects of machine performance from those related to local election management or other county-specific factors. In fact, one of four counties using the Sequoia system—Palm Beach—had a relatively low summary undervote rate, which supports the possibility that high rates in the other three counties could be the result of county-specific factors.

- Despite the system's poor relative ranking with regard to undervoting, this analysis of undervote rates does not allow us to draw any valid conclusions about machine performance problems in these counties. Additional research would be required to determine the cause of the elevated undervote rate.

#3. ES&S Op-Tech Voting System

- Contrary to the state report's findings, we discovered that the abnormally high cumulative undervotes on absentee ballots in the ES&S Op-Tech counties was not a systemwide problem, but the result of excessive undervote rates in Orange County, which had by far the highest undervote rate on absentee ballots of any county in Florida.

[7] This does not mean that particular pieces of equipment did not malfunction; rather that no malfunctions can be inferred from the undervote rates alone.

- If we remove Orange County from the calculation, the remaining ES&S Op-Tech counties have the best summary undervote rate in the state at 2.3 percent—even though four of these counties used the same high-speed scanner as Orange County.

- *Orange County's high speed optical scanner—the Op-Tech IV-C—failed to count more than a thousand legitimately cast votes.* The county was unaware of the problem until notified by us. Their subsequent inspection of the ballots confirmed the loss of votes.

- The absentee ballot scanner used by Orange County is known to have problems reading gel inks if not properly calibrated. A quick search of the internet turned up numerous references to problems with this particular optical scanner reading low carbon content inks, such as gel inks. *The vendor—and presumably the state—has been aware of this problem for years.*

- *Orange County has been losing validly cast votes because of this problem at least since the 2000 election.* During the Florida recount, more than 400 ballots rejected by the machines were found by staff to be indistinguishable from those that were counted. The reason suggested at the time for the problem was "low carbon content in the ink pens used to mark them," the same reason given for the uncounted ballots in 2006. In 2004, Orange County also experienced suspiciously elevated undervote rates on absentees.[8]

- ***We found no indication that the state or vendor warned any of the Op-Tech counties about the known-problem with the scanners. Nor is there any indication of action on the part of the state, vendor, or county to ameliorate this unnecessary disenfranchisement of Orange County voters during the last decade.***

#2. Diebold (now called Premier) Blended

- Our analysis of undervote rates found no systemic problems with the Diebold system.

#1 ES&S Blended

- We found no systemic problems with the ES&S optical scan system.

[8] Lance Dehaven Smith, 2005, *The Battle for Florida: An Annotated Compendium of Materials from the 2000 Presidential Election* (University Press of Florida: Gainesville, FL), Chapter 2, Appendix, pgs. 66-67.

DISCUSSION

FLORIDA'S CERTIFIED VOTING SYSTEMS

At the time of the 2006 general election, five voting systems were being used throughout the state of Florida—two based on DREs (direct recording electronics), commonly called touchscreens, for precinct and early voters[9] and three blended systems that used optically scanned paper ballots for all nondisabled voters, with DREs for disabled accessibility.[10] All Florida counties used optical scanners for absentee ballots.[11]

The two certified touchscreen systems at the time of the 2006 general election were the ES&S iVotronic and the Sequoia AVC Edge I. The so-called "blended" or optical scan systems were: the Diebold Blended, ES&S Blended, and ES&S Op-Tech Blended. Table 1 below gives the basic components of these systems and the number of votes cast on each system:[12]

Table 3. Florida Certified Voting Systems, 2006 General Election

System	Type	No. of Counties*	Turnout	Precinct Tabulator	Disabled Accessible	Absentees
ES&S iVotronics	Touch screen	11	1,588,091	12" or 15" iVotronics	iVotronic	M-650 (high speed)
Sequoia Edge	Touch screen	4	1,001,807	AVC Edge I	Edge	Op-Tech 400-C (high speed)
Diebold Blended	Optical scan	30	1,554,738	Accu-Vote OS	TSX	Accu-Vote OS
ES&S Op-Tech	Optical scan	7	478,555	Op-Tech III-P	iVotronic	Op-Tech IV-C or Op-Tech III-P
ES&S Blended	Optical scan	14	251,717	M-100	iVotronic	M-650 or M-100
Sub-Total	Optical scan	51	2,285,010 (46.87%)			
Sub-Total	Touch screen	15	2,589,898 (53.13%)			
Total		66	4,874,908			

**Note:* 31 counties used the Diebold blended system; however, Glades has been omitted from the calculations because in some races the number of votes cast exceeds turnout. Clearly, these numbers are not reliable.
Source: Florida Division of Elections website.

[9] Some "blended" counties did not use paper ballots for early voting, but used their disabled accessible DREs instead. Regardless of location, each early voting site is open to all voters in the county; thus, each site must have all ballot styles available. A few counties decided that it would be easier for them to meet this requirement with DREs. Most blended counties, however, used paper ballots for all early voting and election day nondisabled voters.
[10] Disabled accessible DREs can be used by any voter; however, in most counties, few nondisabled voters chose to use the equipment.
[11] For the purposes of this paper, we will refer to the "blended" systems as optical scan or OS systems as their primary voting equipment is an optical scanner.
[12] Information about firmware versions, central tabulators, and other hardware and software components can be found on the Florida Division of Elections website

The touchscreen systems served 15 counties, and the optical scan "blended" systems served the remaining 52 counties. Despite the relatively small number of counties that used the touchscreen systems, they actually served slightly over half (53%) of Florida's voters. This is due to the fact that the touchscreen counties included some of the largest urban counties in south Florida. Of course, within these touchscreen counties, optical scanners were used to process paper absentee ballots. In some of the larger optical scan counties, the disabled accessible touchscreens were the only machines used for early voting. All in all, very nearly equal numbers of ballots were cast by each method. The 2006 state overvote and undervote report indicates that 50.2 percent of the ballots cast in the 2006 general election were cast on paper and the remaining 49.8 percent were cast on DREs.[13] A complete list of Florida counties, giving their voting systems, turnout, and undervote rates in the top races, see Appendix B of this report.

FLORIDA'S 2006 GENERAL ELECTION—BASIC FACTS

In the even years between presidential elections, Florida elects not only its Governor and Lt. Governor, but the entire state cabinet—Attorney General, Chief Financial Officer, and Commissioner of Agriculture. In 2006, only the Commissioner of Agriculture was an incumbent; all other seats were open. The only other statewide race was for U.S. Senator.

Other races on the 2006 ballot included the U.S. House of Representatives, Florida House of Representatives, some Florida Senate seats, many local races, and a host of important and controversial proposed constitutional amendments that addressed such high-profile issues as limitations on property taxes, increasing the homestead exemption for low-income seniors, and a prohibition on property taken under eminent domain from being transferred to private entities.

Despite the competitiveness of the races and the intense public interest in both the candidates and the constitutional amendments, turnout was down compared to 2002. About 4.9 million people voted in Florida's 2006 general election for a turnout statewide of about 47 percent. In 2002, turnout was above 55 percent.

Florida is closely divided between the two major parties so statewide races are generally competitive. In 2006, about 4.2 million of the state's 10.5 million registered voters were Democrats and 3.9 million were Republicans. Just under 2 million had no party affiliation listed, and the rest belonged to minor parties.

In contrast, Congressional and state legislative races are often noncompetitive due to the fact that these districts are heavily gerrymandered to favor the incumbents. Thus, despite the close partisan makeup of the Florida electorate, both houses of the state legislature are disproportionately Republican.

APPROACH, METHODOLOGY, AND SOURCES

[13] Cite table from report, Senate race.

For the purposes of this paper, we have used undervote rates in all five top-of-the ballot statewide races to produce a summary undervote rate for each voting system for each race and a cumulative undervote rate for each voting system for all five races. While we have attempted to extricate undervotes from the other residual votes, we cannot guarantee that some of our undervote data do not include other types of residual votes. Some counties report their residual votes by category—overvotes, undervotes, and write-ins—others simply lump them together. For the U.S. Senate and Governor's race, we are able to provide this breakdown since the state required the counties to supply this information for its state overvote and undervote report and it is given in the data tables that accompany the report.

Electronic voting systems—both touchscreen and optical scan—generally do not permit overvotes. In 2006, overvoting was not a major problem except on absentee ballots where the voter does not have a chance to correct his ballot. Undervotes, however, continued to be a serious problem—as evidenced by Sarasota's Congressional District 13 race, in which excessive undervotes mostly likely changed the outcome of the election.[14] As we discovered in the ensuing contest of election, lawsuits, state audit, Congressional investigation, and deluge of academic papers, undervotes are particularly a problem with touchscreen systems that do not permit us to distinguish between intentional and unintentional undervoting.

Voters, of course, have the right to refrain from voting in a particular race, and intentional undervoting, particularly in down-the-ballot races, can be fairly substantial. Higher rates of intentional undervoting in top-of-the ballot races are sometimes experienced when races are not competitive, do not involve high-profile candidates, or have been characterized by a highly negative campaign. By looking at statewide races, which involve 67 separate, but otherwise identical elections for the same offices, however, we can determine with relative accuracy a range for "normal" undervoting, that is, intentional undervoting along with a small amount of unintentional undervoting due to normal voter errors. Thus, we can identify undervote rates that fall outside the norm, indicating special problems.

Unintentional undervotes occur when a voter's choices are not properly recorded.[15] This can result from a multitude of possible causes—confusing ballot design, machine malfunctions, long waits to vote, poorly trained poll workers, inadequate voter education, and a multitude of other problems. In fact, anything that makes it more difficult for the voter to navigate through the ballot and make his or her choices will inevitably drive up undervoting. When multiple problems occur and interact, truly excessive undervotes can occur.

Another complication is the fact that Florida law allows counties to convert overvotes on absentee ballots into undervotes. This process, called duplication, involves copying the votes from the rejected ballot onto a new ballot, leaving the overvoted race blank, and running the newly marked ballot through the scanner. Therefore, it is impossible to be sure that our

[14] While there is still considerable disagreement on the cause of the undervotes in the CD-13 race, all the major experts who have investigated the race—including the FSU computer scientists and the U.S. General Accountability Office—agree that the undervotes cost Jennings the race.

[15] "Unintentional" includes instances where the voter was aware his choice wasn't recorded, e.g., the review screen shows his choice has disappeared, but he decides to cast his ballot anyway. We know that such undervoting did happen.

numbers do not contain other types of residual votes, but from a practical standpoint a few converted overvotes sprinkled into the mix will not likely make much of a difference.

Top-of-the-Ballot Statewide Races

For our assessment, we used undervote rates from the following races: U.S. Senator, Governor/Lt. Governor, Attorney General, Chief Financial Officer (CFO), and Commissioner of Agriculture (COA). These races appeared on the ballot in every county, in the same order, with the same candidates listed in the same sequence within each race. This makes undervote rates on these races ideal for making valid comparisons across counties and voting systems. The undervote rate for each system on each race was calculated by totaling the undervotes in each constituent county and simply dividing by the number of votes cast. A cumulative undervote rate for all five races was obtained by adding together the undervotes on each system in each race and dividing by the number of votes cast in each race—that is, the turnout times five. We are then able to compare the relative performance of each of the individual systems.

We excluded the U.S. House of Representatives' races from consideration because of their lack of comparability. Each congressional race features different candidates and has unique characteristics and dynamics that can influence undervoting; consequently, the level of normal undervoting is not as easily established as it is with races that are comparable statewide. Furthermore, in Florida, when a congressional seat is not contested, the race does not appear on the ballot; therefore, some counties had congressional races on all their ballots, and some did not. Some counties, such as Sarasota, included only one congressional district, while others were parts of several districts.

We also want to note that we have not always broken down undervotes for each voting system by mode of voting—polling, early voting, and absentee, nor by constituent counties, although both would be necessary for a thorough evaluation of voting system performance.[16] For the purposes of this paper, we have limited our examination of this type of data to the particular circumstances where our analysis of summary data suggested that we needed to do so. In some instances, undervote information by mode of voting was available from our previous reports on excessive undervotes in the 2006 election and from the state overvote and undervote report.

State and County Data

The data tables from the state overvote and undervote were the source for our information on the U.S. Senate and Governor's races. For the other three races, we used the numbers from the county's official summary and precinct-level results as well as data from the Florida Division of Elections website. Data from 66 of Florida's 67 counties are used for this assessment. Glades County, which uses the Diebold Blended system, had to be dropped from the calculations because its turnout numbers were in some cases less than the total votes counted. Obviously, this called into question the reliability of its data. So its turnout numbers have been deducted from the state totals and its numbers are not included in any of the Diebold data.

The reader will note that the undervote rates for individual races are given to the hundredth of a percent while the cumulative rating for all races is given to the thousandth of a percent. The

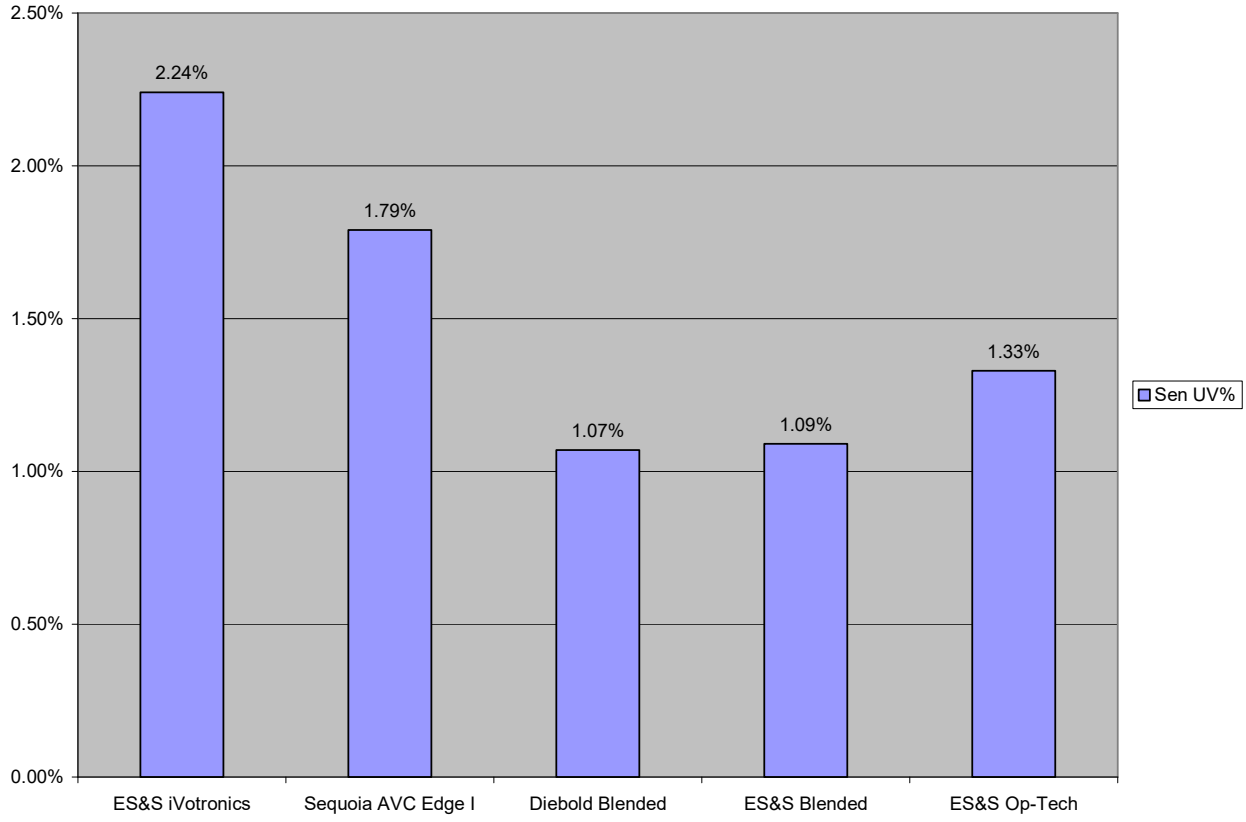
[16] A list of all Florida counties, by voting system, and their undervote rates for all five statewide races is Appendix A to this report.

reason for the difference involves the size of the base population. The cumulative percentage is based on five times the number of votes cast as for each individual race. Even so, we wish to caution readers against assuming that this implies some greater level of accuracy or precision.

Normally, we would look at the five races in the order in which they appeared on the ballot; however, during our investigation, we discovered that four of the five races—U.S. Senator, Attorney General, Chief Financial Officer, and Commissioner of Agriculture—have very similar undervote patterns while the undervote rate and performance by voting system differs substantially in the Governor's race. Thus, it seemed logical to group discussion of the similar races together in order to avoid repetition.

U.S. SENATOR'S RACE

Figure 1.
Undervote Rates by Voting System, U.S. Senate Race, Florida's 2006 General Election



Even the state overvote and undervote report expresses surprise at the high level of undervoting in the U.S. Senator's race.[17] By most measures, the race for U.S. Senate should have had very low undervote rates. It was the first race on every ballot in the state and featured two well-known candidates—the Democratic incumbent, Bill Nelson, and his Republican challenger, Katherine Harris, who gained national notoriety during the 2000 election debacle when she was Florida's secretary of state. Four minor candidates appeared on the ballot, and two other

[17] Reference here.

candidates qualified as write-ins. Thus, the race took a sizable amount of space on the first page of touch screen ballots and most of the first column on paper ballots. Going into election day, polls showed that Nelson would win by a large margin. The final results were: Nelson, 60.3 percent, Harris, 38.1 percent, with none of the remaining candidates getting more than 0.5 percent of the vote.

Comparison of Systems

As discussed in a previous paper,[18] the undervote rate on the ES&S iVotronics in this race was markedly higher than on any other system. Its rate of 2.24 percent is 25 percent higher than the second-worst-ranked Sequoia DRE system, and more than *double* the undervote rates for the Diebold and ES&S OS systems (1.07% and 1.09% respectively). Even compared to the worst performing optical scan system, the ES&S Op-Tech, the iVotronics' undervote is 68 percent higher.

While the undervote rate on the Sequoia system is much lower than the iVotronics, it is still quite high—about 35 percent higher than the next worst-ranked system, the ES&S Op-Tech, which the state overvote and undervote report says had high undervote rates on its absentees.

The ES&S OS and Diebold OS systems had nearly identical undervote rates of 1.09 percent and 1.07 percent respectively. These rates do not indicate any systemic problems.

Impact of Undervoting

As seen in the table below, the ES&S iVotronics counties accounted for about one third of the state's turnout (32.58%), but nearly half of the state's undervotes in this race (44.94%). In contrast, the Diebold optical scan system, which also serves about one in three of the state's voters, accounted for only about 1 in 5 of the state's undervotes. The Sequoia system accounted for a slightly higher percentage of undervotes than its share of state turnout.

Table 4. Undervote Rates by Voting Systems, U.S. Senate Race, Florida's 2006 General Election

	%, State Turnout	Total UVs	%, State Uvs	Tot UV%
ES&S iVotronics	32.58%	35,623	44.94%	2.24%
Sequoia AVC Edge I	20.55%	17,902	22.58%	1.79%
Diebold Blended	31.89%	16,647	21.00%	1.07%
ES&S Op-Tech	9.82%	6,367	8.03%	1.33%
ES&S Blended	5.16%	2,732	3.45%	1.09%
State		79,271		1.63%

We obtained a rough measure of excess undervotes by comparing each system's actual undervotes to what it would have experienced if it had had the same undervote rate as the best-performing system. This comparison gives us a good idea of the disproportionate impact on statewide undervoting caused by the poor performance of the ES&S iVotronics voting system.

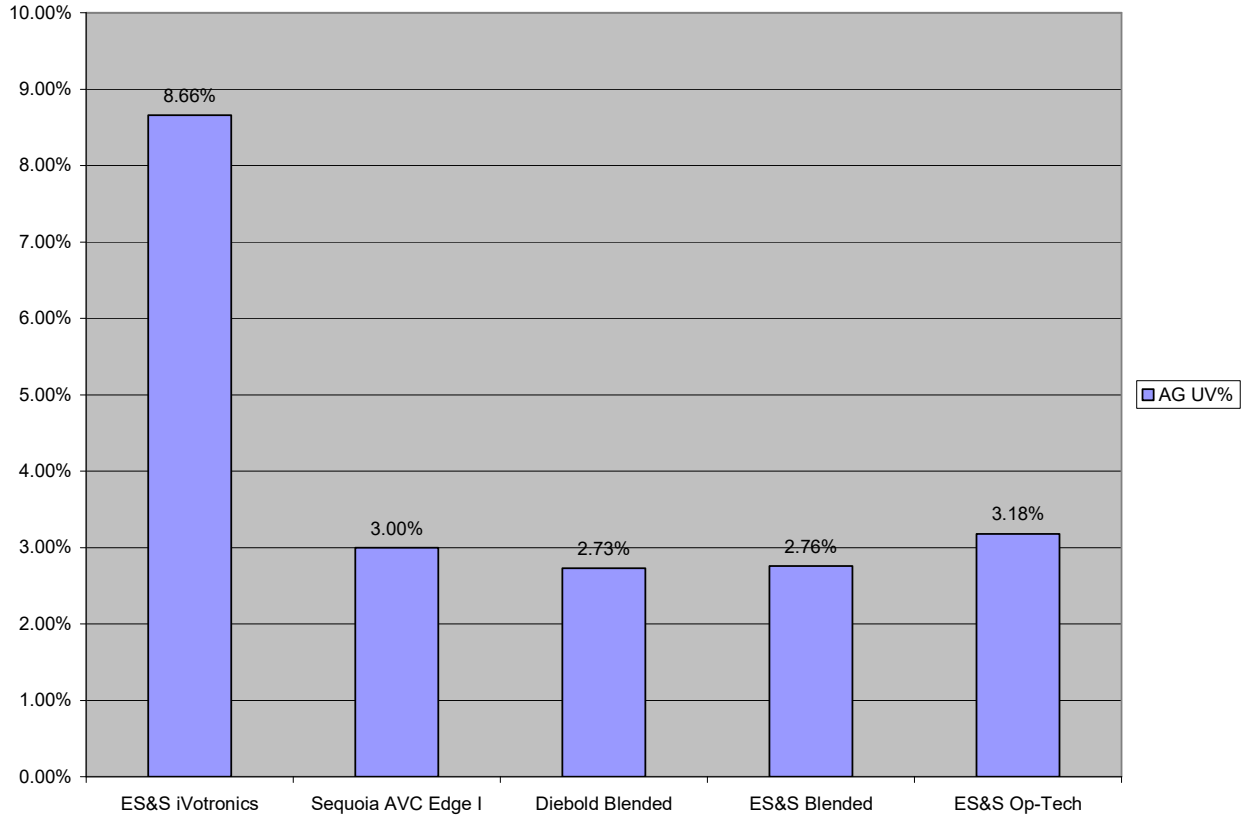
[18] Lost Votes…

Table 5. Estimated Excess Undervotes by Voting System
U.S. Senator's Race, Florida's 2006 Election

Voting System	Actual UVs	UVs at Best Rate	Excess Undervotes
ES&S iVotronics	35,623	16,993	18,630
Sequoia AVC Edge I	17,902	10,719	7,183
Diebold Blended	16,647	16,647	0
ES&S Op-Tech Blended	6,367	5,120	1,247
ES&S Blended	2,732	2,693	39
Total	79,271	52,172	27,099

ATTORNEY GENERAL'S RACE

Figure 2. Undervote Rates by Voting System, Attorney General, Florida's 2006 General Election



None of the other contests in the 2006 election came close to having the undervote spikes that occurred in the attorney general's race in five iVotronic counties. In two of the five counties—Charlotte and Sumter—undervote rates on non-absentee ballots were as high as 25 percent; in Lee County, the non-absentee undervote rate was 20 percent.

The undervote spikes on the iVotronics in this race are exhaustively discussed in our previous paper on the topic, "Lost Votes on the ES&S iVotronics in Florida's 2006 Election, Part II. The Attorney General's Race." In that paper, we broke down the undervotes by mode of voting and showed that these undervote problems occurred only on their iVotronics and not on their optically scanned absentee ballots, which (for the most part) had normal undervote rates.

Nothing about the dynamics of this contest would have suggested high undervote rates. It featured two well-known candidates—former U.S. Representative Bill McCollum and Florida Senator Walter "Skip" Campbell. McCollum is perhaps best known for leading the efforts of House Republicans to impeach Bill Clinton. In 2004, McCollum lost to Mel Martinez in a closely contested battle for the Republican nomination for the U.S. Senate seat being vacated by popular Democratic Senator Bob Graham. The Democratic candidate Skip Campbell was a prominent Democratic member of the Florida Senate, representing portions of Broward County.

The candidates were well known, the campaign wasn't particularly nasty, and both men appealed primarily to their party base. While the race was competitive, McCollum consistently led in the polls. McCollum won with 52.7 percent of the vote to Campbell's 47.3.

Comparison of Systems

Considering the findings from our previous research on this race, we were not surprised to find that the undervote rate on the iVotronics system of nearly 9 percent (8.66%) was almost three times (289%)that of the Sequoia touch screen system at 3 percent and more than three times the undervote rates on the ES&S OS and Diebold OS. (See Figure 4 below.)

The ES&S Op-Tech counties had the second highest rate at 3.18 percent, again reflecting problems with the Op-Tech IV-C absentee ballot scanner. As in the Senate race, the ES&S Blended system and Diebold Blended system had very similar undervote rates at 2.76 percent and 2.73 percent respectively.

In short, the undervote rates on four of the five systems were very similar and ranged from a high of 3.18 percent to a low of 2.73 percent.

Impact of Undervoting

The consequences of the problems with the iVotronics in this race are profound. With only 3 in 10 of the state's voters (32.58%), the iVotronics contributed nearly 6 in 10 (59.23%) of the state's undervotes in this race. (See Table below.) Once again, comparing the ES&S iVotronics system to the Diebold system is illustrative. With similar numbers of votes cast, the ES&S iVotronics had 95,000 fewer votes counted in this race than did the Diebold system.

Table 6. Undervote Rates by Voting System, Attorney General's Race, Florida's 2006 General Election

System	%, State Turnout	Total UVS	%, State Uvs	Total UV %
ES&S iVotronics	32.58%	137,526	59.23%	8.66%
Sequoia Edge	20.55%	30,087	12.96%	3.00%
Diebold Blended	31.89%	42,420	18.27%	2.73%
ES&S Op-Tech	9.82%	15,213	6.55%	3.18%

System	%, State Turnout	Total UVS	%, State Uvs	Total UV %
ES&S Blended	5.16%	6,958	3.00%	2.76%
State		232,204		4.76%

As in the U.S. Senator's race above, we estimated excess undervotes for each system by comparing the number of actual undervotes to those that would have occurred at the same rate as the best-performing system:

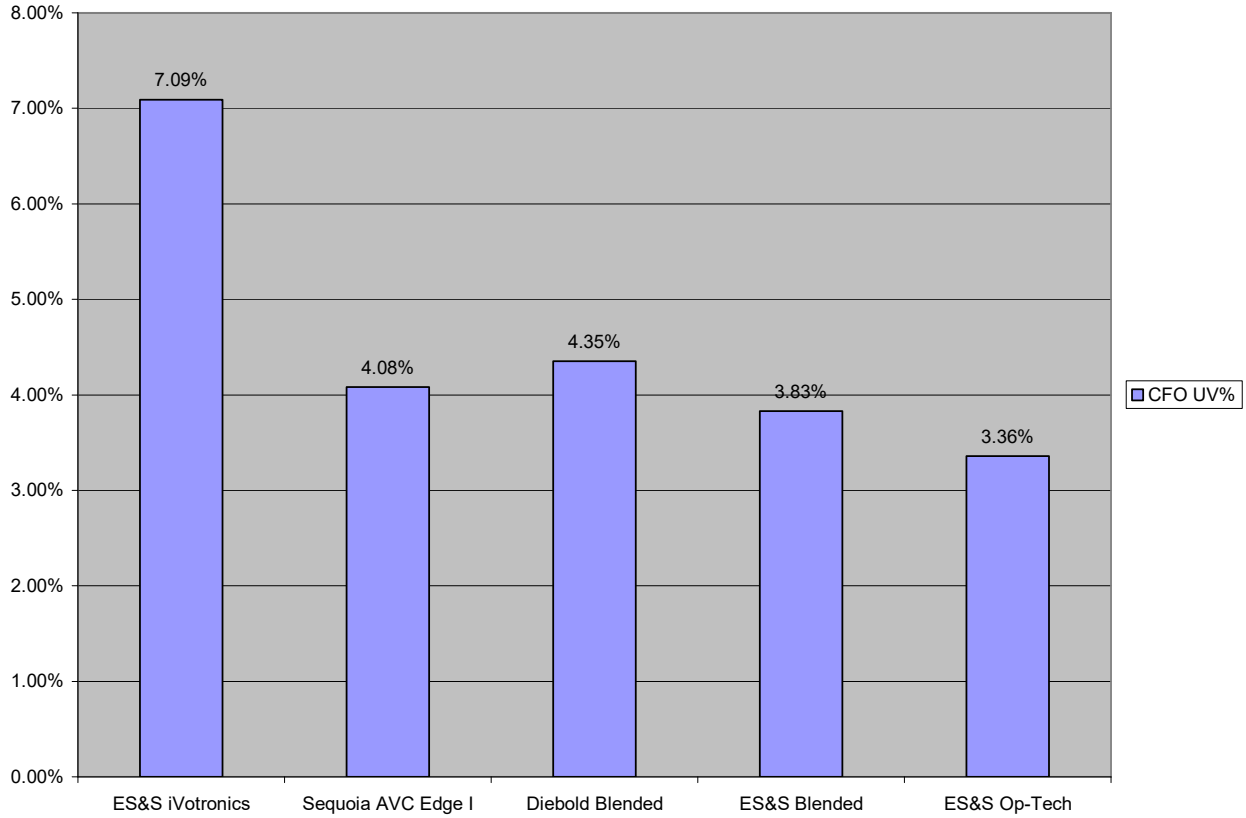
Table 7. Estimated Excess Undervotes by Voting System Attorney General's Race, Florida's 2006 Election,

Voting System	Actual UVs	UVs at Best Rate	Excess Undervotes
ES&S iVotronics	137,526	43,355	94,171
Sequoia AVC Edge I	30,087	27,349	2,738
Diebold Blended	42,420	42,420	0
ES&S Op-Tech Blended	15,213	13,065	2,148
ES&S Blended	6,958	6,872	86
Total	232,204	133,085	99,019

We can see in the above table that excess undervotes on the iVotronics made up 95 percent of the lost votes in this race.

CHIEF FINANCIAL OFFICER'S RACE

Figure 3. Undervote Rates by Voting System, CFO's Race, Florida's 2006 General Election



The Chief Financial Officer's race featured two well known and well liked candidates: former President of the Florida Senate, Republican Tom Lee, and former president of Bank of America, Democrat Alex Sink. Sink is also the wife of former gubernatorial candidate Bill McBride who lost to Jeb Bush in 2002. Both candidates are from the Tampa area.

Tom Lee faced two opponents in the primary, but Sink had no Democratic challenger. Both candidates were perceived as moderates and had support across party lines and with independents. Sink won with 53.5 percent of the vote to Lee's 46.5 percent. Sink was the only Democratic candidate to win a spot in the state cabinet.

Comparison of Systems

Again, the iVotronic system had a much greater undervote rate than any of the other systems. Its rate was 63 percent higher than the next-worst performing system in this race, the Diebold Blended. It was more than 74 percent higher than the other all-touchscreen system and more than double the rate on the ES&S Op-Tech, which had the best performance in this contest.

The relatively poor performance of the Diebold OS system, which had the second worst undervote rate in this contest, is a surprise since it generally performed well in the other top-of-the-ballot races.

Even more surprising is the fact that the ES&S Op-Tech had the best performance in this race—despite its known loss of votes on absentees.

The ES&S Blended system once again performed relatively well.

Impact of Undervoting

Once again, higher undervotes on the ES&S iVotronics translated into a large number of uncounted votes because so many Florida voters used this system. Relatively good performance on the ES&S Blended had little effect because of the small number of users—fewer than in many medium-sized Florida counties.

Table 8. Undervote Rates by Voting System, Chief Financial Officer's Race, Florida's 2006 General Election

System	Type	Turnout	% of State Turnout	Total UVS	% of State UVs	Total UV%
ES&S iVotronics	TS	1,588,091	32.58%	112,564	45.61%	7.09%
Sequoia Edge	TS	1,001,807	20.55%	40,824	16.54%	4.08%
Diebold Blended	OS	1,554,738	31.89%	67,703	27.43%	4.35%
ES&S Op-Tech	OS	478,555	9.82%	16,071	6.51%	3.36%
ES&S Blended	OS	251,717	5.16%	9,650	3.91%	3.83%
State		4,874,908		246,812		5.06%

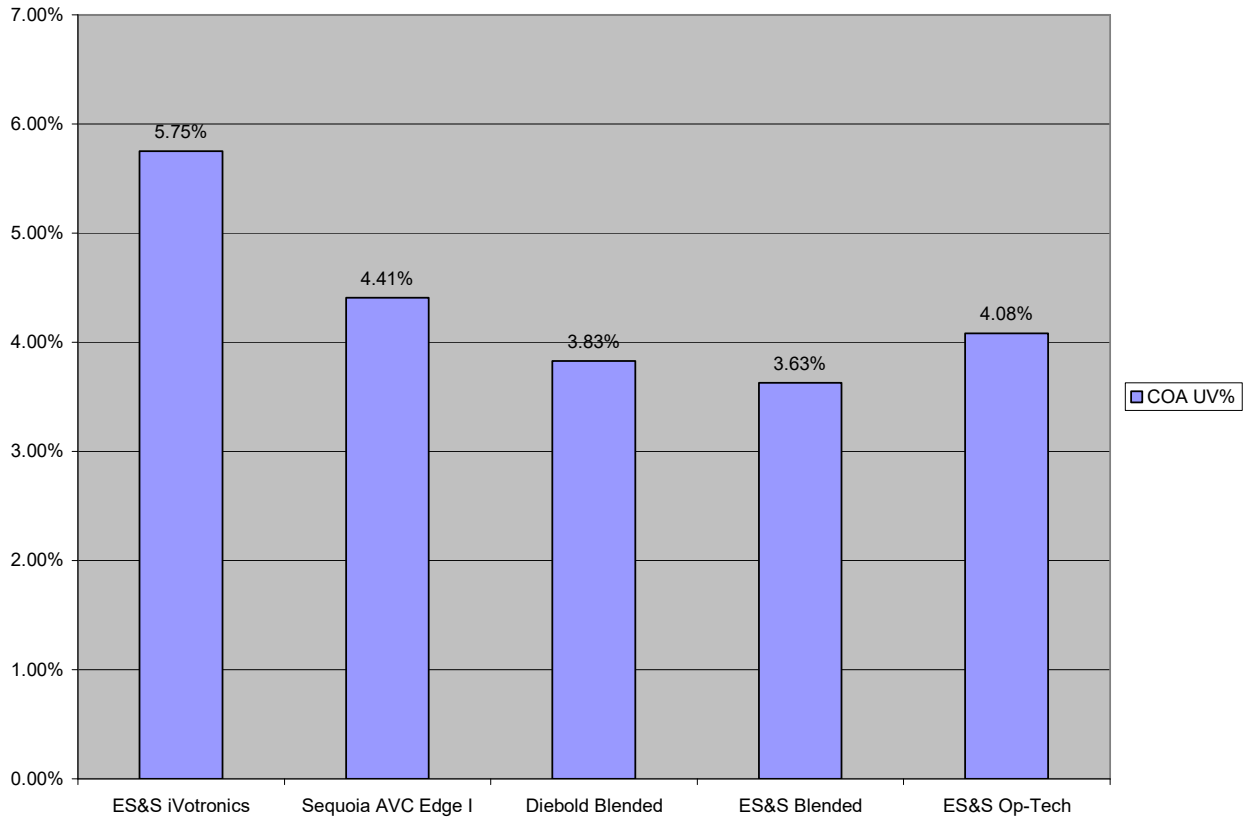
Estimated excess undervotes in this race are as follows:

Table 9. Estimated Excess Undervotes by Voting System CFO's Race, Florida's 2006 Election,

Voting System	Actual UVs	UVs at Best Rate	Excess Undervotes
ES&S iVotronics	112,564	53,360	59,204
Sequoia AVC Edge I	40,824	33,661	7,163
Diebold Blended	67,703	52,239	15,464
ES&S Op-Tech Blended	16,071	16,071	0
ES&S Blended	9,650	8,458	1,192
Total	246,812	163,789	83,023

COMMISSIONER OF AGRICULTURE'S RACE

Figure 4. Undervote Rates by Voting System, Commissioner of Agriculture Race, Florida's 2006 General Election



The Commissioner of Agriculture race was the only one of the four state cabinet offices to feature an incumbent. Interest in this race was less keen than in the others, and the result a foregone conclusion. Considering that it was at the bottom of the five races, a higher undervote rate in this race was expected. Republican Charlie Bronson bested Democrat Eric Copeland by a comfortable margin—57 percent to 43 percent.

Comparison of Voting Systems

The patterns in this contest are similar to what we have seen in the other races. Once again, the iVotronics have a significantly higher undervote rate than the other touch screen system, the Sequoia Edge—5.75 percent vs. 4.41 percent or 30 percent higher. The iVotronic undervote rate was nearly 60 percent higher than the best performing system, the ES&S OS.

The highest rate among the optical scanners is once again the ES&S Op-Tech at 4.08 percent; the lowest rate is 3.63 percent on the ES&S Blended, with the Diebold Blended System about halfway between at 3.83 percent.

Impact of Undervoting

Interestingly, the total number of undervotes in this race is less than experienced in either of the two contests that directly preceded it—the attorney general's race and the chief financial officer's race.

Once again, the iVotronics voting system constitutes a much larger portion of statewide undervotes (41%) than of statewide turnout (33%). But this time, it is the only system to do so. All other systems—including the second-worst-ranked Sequoia system—account for a smaller percentage of statewide undervotes than of turnout.

Table 10. Undervotes by Voting System, Commissioner of Agriculture Race, Florida's 2006 General Election

System	Type	Turnout	% of State Turnout	Total UVs	% of State UVs	Total UV%
ES&S iVotronics	TS	1,588,091	32.58%	91,263	40.82%	5.75%
Sequoia AVC Edge	TS	1,001,807	20.55%	44,187	19.76%	4.41%
Diebold Blended	OS	1,554,738	31.89%	59,477	26.60%	3.83%
ES&S Op-Tech	OS	478,555	9.82%	19,521	8.73%	4.08%
ES&S Blended	OS	251,717	5.16%	9,140	4.09%	3.63%
State		4,874,908		223,588		4.59%

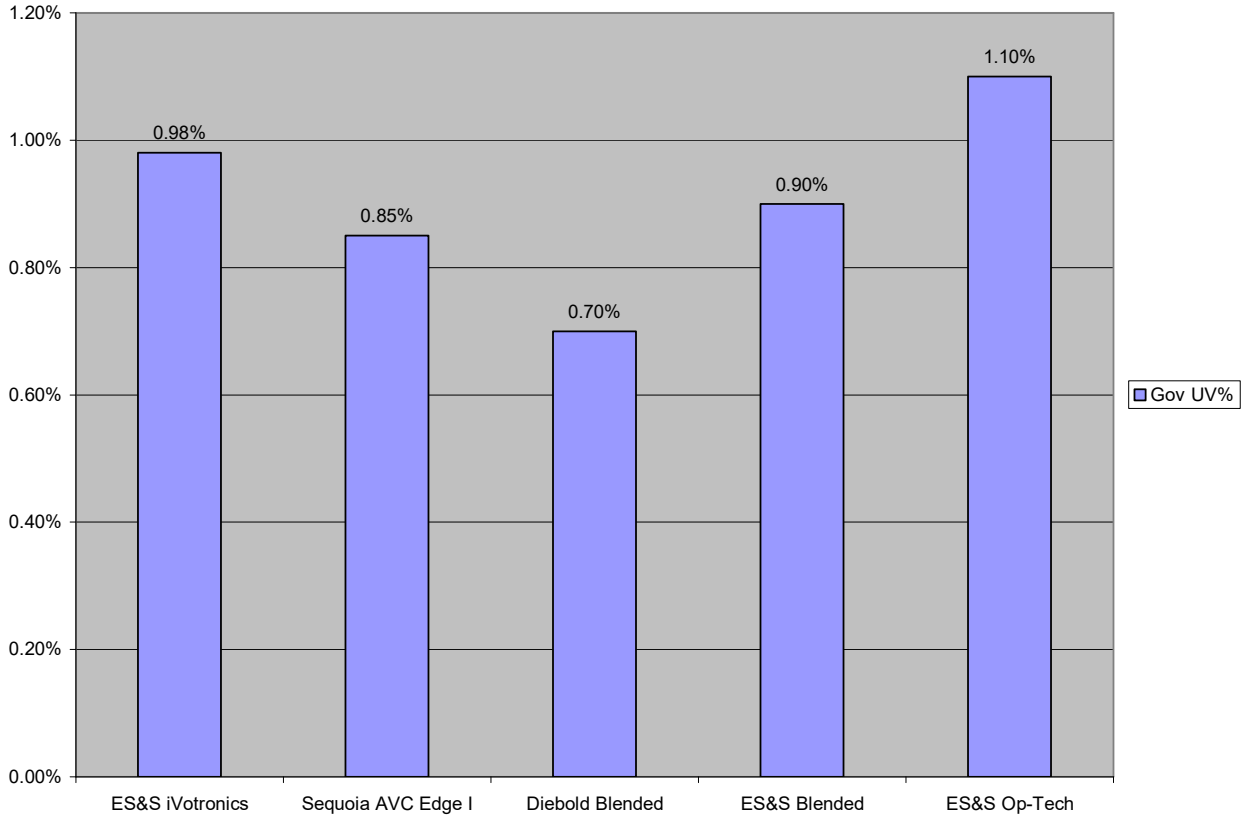
Our calculation of excess undervotes by voting system shows that the ES&S iVotronics accounted for nearly three-fourths (72%) of the total excess undervotes in this race.

Table 11. Estimated Excess Undervotes by Voting System COA's Race, Florida's 2006 Election,

Voting System	Actual UVs	UVs at Best Rate	Excess Undervotes
ES&S iVotronics	91,263	57,648	33,615
Sequoia AVC Edge I	44,187	36,366	7,821
Diebold Blended	59,477	56,437	3,040
ES&S Op-Tech Blended	19,521	17,372	2,149
ES&S Blended	9,140	9140	0
Total	223,588	167,823	46,625

GOVERNOR/LT. GOVERNOR'S RACE

Figure 5. Undervote Rates by Voting System, Governor's Race, Florida's 2006 General Election



Without a doubt, this was the highest profile race in the 2006 general election—it was extremely competitive, lacked an incumbent, and featured two well-known, popular candidates—Republican Charlie Crist and Democrat Jim Davis. Crist was the retiring attorney general and previously served as commissioner of education. Davis was a member of the U.S. House of Representatives, the last Democratic majority leader in the state senate, and descended from a well-known Florida family. Both men faced a challenger in the primary, but the Democratic primary, which pitted Davis against Rod Smith, was more contentious, expensive, and divisive.

On most ballots, the Governor/Lt. Governor's race was the third race on the ballot, following the U.S. Senator and U.S. House of Representatives race. In counties without a contested U.S. House race, the Governor's race became the second race on the ballot. It was also a long race—that is, it took up most of the page on touchscreen ballots as six pairs of candidates and a write-ins space had to be accommodated.

Charlie Crist won this contest with 52.2 percent of the votes to Jim Davis' 45.1 percent. Reform Party candidate Max Linn won 1.9 percent of the vote, with the other candidates splitting the remainder of the votes.

Comparison of Systems

This is the race that brought voters to the polls so we expected it to have the lowest undervote rates—and it did. What is striking about this race, however, isn't the relatively low undervote rates, but the similarity in undervote rates for all five systems. In fact, all five systems have

undervote rates between 1.10 percent and 0.70 percent. Not coincidentally, this is the only race in which the ES&S iVotronics do not have the highest rate of undervotes.

This time, the ES&S Op-Techs have the worst undervote rate at 1.10 percent. This rate is about 11 percent higher than the undervote rate on the iVotronics and 57 percent higher than the Diebold blended system, which had the lowest undervote rate at 0.70 percent. The ES&S blended system had an undervote rate of 0.90 percent, precisely halfway between the Op-Techs at the top and Diebold at the bottom. Vote loss due to voting system design or performance problems in this race appear to be about 2,000—much lower than any of the other races—even though we know that this system is acknowledged as having lost votes due to voting system problems.

Interestingly, the Op-Tech's ranking as the worst in this race does not appear to be due to any difference in its performance, but rather to the much better performance of the two touchscreen systems in this race. As noted earlier, we know that votes were lost on the Op-Techs in all the races because of voting system performance problems.

In this race, the Sequoia system performs relatively well—second only to the Diebold system (0.85% and 0.70% respectively) and slightly better than the ES&S Blended (0.85% vs 0.90%).

So the question here is why those two systems performed so much better in this race than in the others.

Table 12. Undervote Rates by Voting System, Governor's Race, Florida's 2006 General Election

System	Type	Turnout*	% of State Turnout	Total Uvs	% of State Uvs	Tot UV%
ES&S iVotronics	TS	1,588,091	32.58%	15,635	36.94%	0.98%
Sequoia AVC Edge I	TS	1,001,807	20.55%	8,482	20.04%	0.85%
Diebold OS	OS	1,554,738	31.89%	10,672	25.22%	0.70%
ES&S Op-Tech OS	OS	478,555	9.82%	5,272	12.46%	1.10%
ES&S OS	OS	251,717	5.16%	2,263	5.35%	0.90%
State		4,874,908		42,324		0.87%

*Note: Numbers do not include Glade County because of problems with its data. Glades is a Diebold Op-Scan county.

Impact of Undervoting

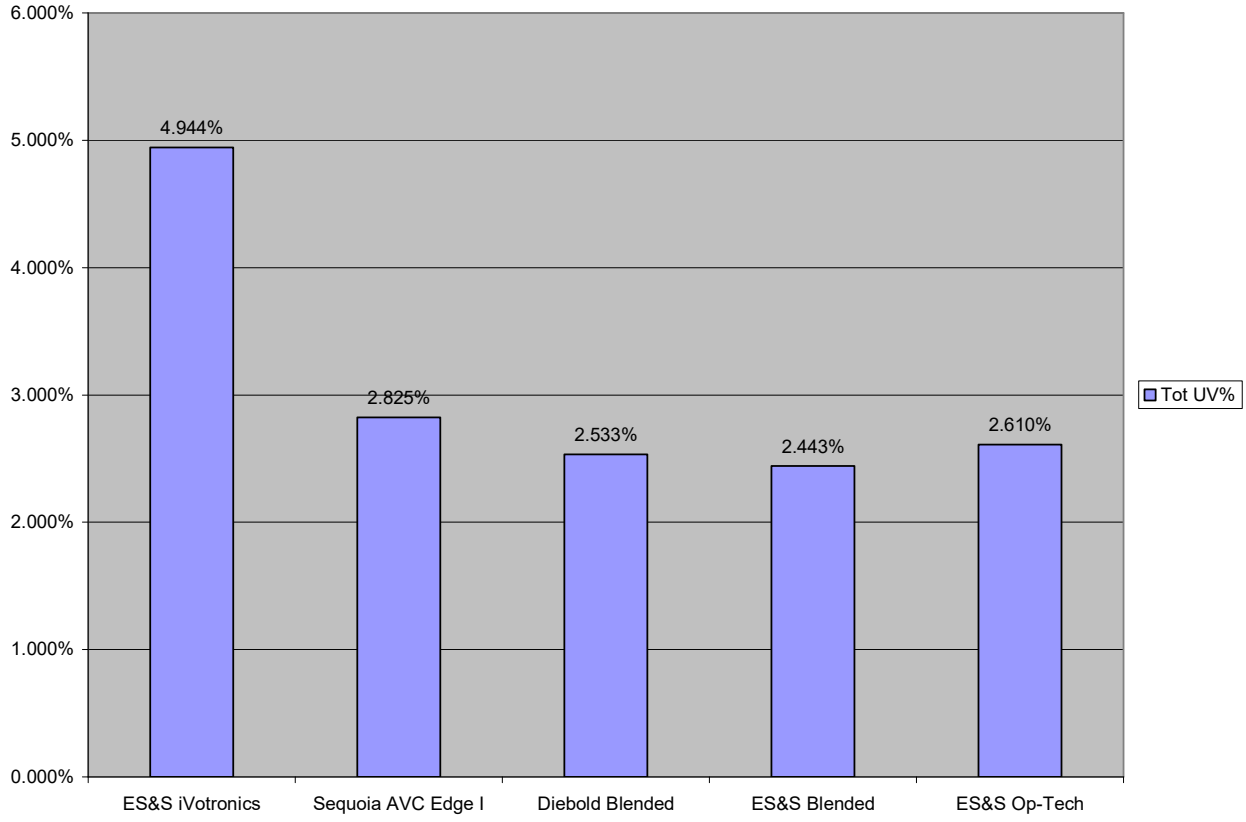
Unlike the other four statewide races, the impact of undervoting in this race is relatively small. Again, the iVotronics have a greater share of statewide undervotes (53%) than their share of turnout (33%). But the ES&S Op-Techs, which are the worst-performing system in this contest, have much great disparity. With only about 10 percent of state turnout, they accounted for more than 22 percent of undervotes in this race. Rather than reflecting a big problem with the Op-Techs in this race, the numbers here reflect the fact that overall undervotes are much lower, and the iVotronics are not skewing the numbers.

Table 13. Estimated Excess Undervotes by Voting System
Governor's Race, Florida's 2006 Election,

Voting System	Actual UVs	UVs at Best Rate	Excess Undervotes
ES&S iVotronics	15,635	11,117	4,518
Sequoia AVC Edge I	8,482	7,013	1,469
Diebold Blended	10,672	10,672	0
ES&S Op-Tech Blended	5,272	3,350	1,922
ES&S Blended	2,263	1,672	591
Total	42,324	33,824	8,500

ALL STATEWIDE RACES

Figure 6. Undervote Rates by Voting System, Statewide Races, Florida's 2006 General Election



This examination of the individual races confirms what we found in our previous research: that the iVotronics performed poorly across *all* statewide races. As expected, the undervote rate on the ES&S iVotronic system was dramatically higher than on any other system and well above the 1 to 3 percent rates that would be expected on top-of-the-ballot races. Its undervote rate was even a full 75 percent higher than on the second-worst-ranked system, the Sequoia Edge. The iVotronic undervote rate was more than double that of the best-ranked system, the ES&S Blended.

In contrast, undervote rates on the other four voting systems varied only by a few tenths of a percent. The difference between the fourth ranked Sequoia Edge and the top-ranked ES&S Blended system was less than four tenths of a percent.

Yet the state report informs us that the ES&S Op-Tech Blended system had higher-than-expected undervotes on its absentee ballots so we know that system had problems, even though it performed slightly better than the Sequoia system and much better the iVotronics.

Undervote rates on the ES&S Blended and the Diebold Blended system were comparable and within normal limits for top ballot races. The ES&S Blended system had a slightly better rate, but the difference was less than one tenth of a percent. While this does not preclude the possibility of problems, it provides no evidence of problems and suggests that any issues with machine performance were probably not systemic.

Impact on Accuracy

The table below shows each voting systems contribution to overall undervotes statewide. Although the iVotronics accounted for only about a third of the state's voters, it was responsible for nearly half of the state's undervotes in these top races.

Table 14. Undervote Rates by Voting System, Statewide Races, Florida's 2006 General Election

System	Type	Turnout*	%, State Turnout	Total Uvs	% , State UVs	Tot UV%
ES&S iVotronics	TS	1,588,091	32.58%	392,613	47.64%	4.944%
Sequoia AVC Edge I	TS	1,001,807	20.55%	141,482	17.17%	2.825%
Diebold Blended	OS	1,554,738	31.89%	196,922	23.89%	2.533%
ES&S Op-Tech	OS	478,555	9.82%	62,445	7.58%	2.610%
ES&S Blended	OS	251,717	5.16%	30,744	3.73%	2.443%
State		4,874,908		824,206		3.381%

*Note: Numbers do not include Glade County because of problems with its data. Glades is a Diebold Op-Scan county.

In the table below, we combine the excess undervotes for each race shown in Tables __ above to get the total excess undervotes on each of the voting system:

Table 15. Estimated Excess Undervotes by Voting System
Statewide Races, Florida's 2006 Election,

Voting System	Actual UVs	Excess Undervotes, All 5 Races	Percent of Total Votes Cast
ES&S iVotronics	392,613	210,138	2.65
Sequoia AVC Edge I	141,482	26,374	0.53
Diebold Blended	196,922	18,504	0.24
ES&S Op-Tech Blended	62,445	7,466	0.31
ES&S Blended	30,744	1,908	0.15
Total	824,206	264,390	

Thus, with regard to election accuracy in 2006, Florida's voting systems are ranked as follows: (1) ES&S Blended, (2) Diebold Blended, (3) ES&S Op-Tech Blended, (4) Sequoia AVC Edge I, and (5) ES&S iVotronics.

Three of the state's five systems had elevated undervote rates that suggest systemic machine performance problems—the ES&S iVotronics, the Sequoia AVC Edge I, and the ES&S Op-Tech Blended. The Diebold Blended system had elevated undervote rates in the Chief Financial officer's race but performed well in all other top-of-the-ballot races. Race-specific undervote problems suggest that ballot placement or other non-systemic problems could be the cause. While this should be investigated, it is beyond the scope of this report. Thus, the following discussion of performance problems is limited to the ES&S iVotronics, ES&S Op-Tech Blended, and Sequoia AVC Edge I voting systems.

VOTING SYSTEM PERFORMANCE PROBLEMS—CONCLUSIONS AND RECOMMENDATIONS

ES&S iVotronics

Prior to beginning this research, we were well aware of pervasive machine performance problems with the iVotronics. Our examination of records in Charlotte, Lee, Sumter, and Sarasota counties revealed numerous problems with various components—including the power supplies, batteries, screens, PEBs, and firmware.[19] This research, therefore, only confirmed what we suspected—that the iVotronics performed badly across races. In four of the five statewide races, its undervote rate was much worse than that of any other voting system. In only one race—the Governor's race—was its undervote rate even close to being in line with any other system.

It also performed badly across counties. All eight of the counties using the 12" iVotronics experienced excessive undervotes. Two of the three counties using the 15" iVotronics also had very high undervote rates. Because these counties were among the largest in the state (e.g., Broward and Miami-Dade), this had a substantial impact on the state's level of undervoting. Nearly 80 percent of estimated excess undervotes statewide were in the ES&S iVotronics counties. (These are undervotes in excess of what would have been experienced in a contest if the system had done as well as the best-performing system in that contest.) We estimate that there were more than 200,000 unintentional undervotes on this system—votes that would have been counted had they not been cast on the iVotronics.

Table 16. Cumulative Undervote Rate, iVotronic Counties, Statewide Races, Florida's 2006 General Election

Rank	County	Turnout	Total UVS	Tot UV%
66 of 66	Sumter	30,584	10,295	6.732%
65 of 66	Charlotte	55,774	18,146	6.507%
63 of 66	Miami-Dade	410,985	126,518	6.157%
62 of 66	Lee	155,846	45,574	5.849%
61 of 66	Broward	411,489	104,599	5.084%
59 of 66	Martin	53,313	10,416	3.907%

[19] See Lost Votes

Rank	County	Turnout	Total UVS	Tot UV%
58 of 66	Collier	87,673	16,676	3.804%
48 of 66	Sarasota	142,532	23,622	3.315%
43 of 66	Pasco	130,170	20,622	3.168%
42 of 66	Lake	87,074	13,648	3.135%
10 of 66	Nassau	22,651	2,495	2.203%

Further, the high undervotes were confined to the DREs. Absentee ballots in the iVotronics counties have unexceptional undervote rates in line with those in other counties.

Some questions remain, however:

- Why was Nassau County the only iVotronics county to have normal undervote rates in every race? How did it avoid the problems experienced by the other counties?

- If the iVotronics DRE is the problem—and that seems to be the case—why aren't there high undervote rates in early voting in the ES&S optical scan counties that used these machines exclusively for their early voting? One clue might be that these machines are all ADA machines, i.e., machines that present an audio ballot for disabled accessibility.

- Why was the undervote rate on the Governor's race so much closer to normal limits than were the others? Does that tell us anything about why the iVotronics had excessive undervotes on the other races?

ES&S OP-TECH

The state overvote and undervote report noted suspiciously high undervotes on absentee ballots cast on the ES&S Op-Techs—which it called a "curiosity." The report even calculated two separate undervote rates for optically scanned ballots—one with the Op-Tech counties included and one with them excluded. Unfortunately, this appears to have been the extent of the state's concern with this problem.

Our investigation of the same data used by the state very quickly revealed that the problems were not experienced by all of the seven Op-Tech counties; in fact, an examination of county-level data for the seven counties using the system showed that the problem was largely confined to a single jurisdiction—Orange County.

Table 17. Summary Undervote Rates for ES&S Op-Tech Counties, Florida's 2006 General Election

County Rank	County	Turnout	Total UVS	Total UV%
1 of 66	Santa Rosa	42,733	3,999	1.872%
6 of 66	Clay	51,969	5,270	2.028%
14 of 66	St. Johns	61,437	7,080	2.305%
20 of 66	Escambia	87,864	10,519	2.394%
39 of 66	Orange	221,594	33,166	2.993%
56 of 66	Washington	7,377	1,363	3.695%
57 of 66	Holmes	5,581	1,047	3.752%

County Rank	County	Turnout	Total UVS	Total UV%
	Total	478,555	62,445	2.610%

The "County Rank" column shows how the counties ranked among Florida counties, with 1 being the best and 66 the worst. Santa Rosa, Clay, St. Johns, and Escambia all placed in the top third of Florida counties for election accuracy based on undervoting. Santa Rosa was the best in the state. Orange County, which uses exactly the same equipment as these counties, placed in the lower half of Florida counties with respect to undervoting. On the other hand, the two Op-Tech counties with very bad undervote rates are both quite small, Washington and Holmes. These two counties used their precinct tabulator, the Op-Tech III Eagle, for scanning absentee ballots, not the Op-Tech IV-C used by the larger counties. The Eagle, which is used by all seven counties for election day ballots, is not implicated in any general elevation of undervote rates.

For the five counties that use the Op-Tech IV-C, we looked at the undervotes by voting mode in the U.S. Senate and Governor's races,--the contests analyzed by the state overvote and undervote report.

Table 18. Undervote Rates for Op-Tech Counties,
Using Op-Tech IV-C Absentee Ballot Scanner, by Voting Mode,
U.S. Senate and Governor's Races, 2006 Election

	U.S. Senate Race			Governor's Race		
County	ED UV	EV UV	AB UV	ED UV	EV UV	AB UV
Clay	1.08%	1.19%	1.46%	0.62%	0.52%	1.03%
Escambia	1.04%	1.07%	1.34%	1.20%	0.73%	1.17%
Orange	1.12%	0.85%	4.83%	0.84%	0.52%	4.50%
Santa Rosa	0.79%	0.84%	1.34%	1.14%	0.53%	1.07%
St. Johns	1.32%	1.09%	1.65%	0.77%	0.54%	0.84%
Total	1.09%	0.95%	3.20%	0.91%	0.55%	2.83%

Note: ED = election day; EV = early voting; AB = absentee; UV = undervote rate

Four of the five counties have somewhat higher rates on their absentee ballots in the Senate race than they do on ballots cast on election day and early voting, but the difference is quite slight—less than 0.5 percent. In the Governor's race, Escambia and St. Rosa counties actually have lower absentee ballot undervote rates than on their election day ballots.

Only Orange County has a greatly higher undervote on absentees, and its rates are unmistakably higher—as much as four percentage points. In the U.S. Senate race, the absentee ballot undervote rate in Orange County is more than 3 ½ times the election day rate and more than 5 ½ times the early voting rate. The discrepancy on the Governor's race is even higher—6 to 8 ½ times higher on absentees than on either election day or early voting ballots.

Clearly, the primary problem is in Orange County. This translates into bad numbers for the Op-Tech counties overall only because Orange County represents such a large portion of the votes cast on the Op-Tech system. In fact, if we calculate the cumulative undervote rate for the Op-Techs without Orange County, we find that its rate is the best in the state at 2.3 percent.

To put these rates into perspective, we looked at the undervote rates by voting mode statewide in 2006 to see how absentee ballot undervote rates related to election day and early voting undervote rates. Generally, absentee ballot undervote rates were very similar to election day rates. The statewide absentee ballot undervote rate in the U.S. Senate race was 1.70 percent—with the Op-Tech counties removed from the calculation and 1.83 percent, with the Op-Tech counties included. The optical scan counties had an undervote rate for election day and early voting ballots of 1.01 percent. In the Governor's race, the statewide rate for absentee ballots was 0.82 percent, while the rate for optically scanned ballots on election day and during early voting was 0.68 percent.[20]

Overall, it appears that undervote rates on optically scanned ballots do not vary much by mode of voting.

Orange County's Problem and Explanation

The data tables from the state overvote and undervote report show that Orange County had the *highest undervote rate on absentee ballots in the state* for both the U.S. Senate and Governor's race. The summary absentee ballot undervote rate in the U.S. Senate race (minus the Op-Tech system) was 1.70 percent, compared to 4.83 percent for Orange County. In the Governor's race, the state summary undervote rate, without the Op-Techs, was 0.82 percent, compared to 4.50 percent for Orange county. We expect that an examination of the other three statewide races will show excessive undervotes in those races on absentees as well.

In March 2007, we contacted deputy supervisor of elections for Orange County Margaret Dunn and asked her why her county had such high undervote rates on its absentee ballots. She responded that she was unaware of the findings of the state report and unaware that Orange County's rates were elevated. She promised to investigate and call us back. In about two months, she called us back. With her at the time were Orange County legal counsel, a vendor's representative, and members of the elections staff. She said that they had re-examined the ballots in question and determined that indeed some valid votes had not been counted. They had then turned to the vendor for an explanation and were told that the problem was that the scanner had failed to read some types of gel ink. The officials in Orange County were quick to note that they had checked all the races and determined that the none of the results had been affected by the failure to count these votes.

This explanation raises more questions than it answers: Why didn't the other four counties using this scanner have a problem? How long had this been happening? Why didn't the vendor inform the county? Was the state aware of the problem? If not, why not? If it did know, why did it certify a piece of equipment that loses votes?

Napa County, California, March 2004

An internet search turned up numerous references to problems with the Op-Tech IV-C and gel inks. In Napa County, California, in March of 2004, election officials discovered the problem while conducting the 1 percent manual audit required by law. At that time, the vendor (Sequoia in this case) informed the state that the problem was with gel inks. It explained that the

[20] State overvote and undervote report reference here.

machine would only read carbon-based inks unless it was specifically calibrated to read the gel inks. According to the vendor, the machines should have been tested and calibrated for reading the gel inks during the set-up for the election. The problem, a spokesman said, was easily and quickly corrected. Election officials noted that the machine did not uniformly fail to count votes, but randomly dropped votes on ballots marked with gel ink pens.

So it appears that the loss of votes in Orange County was entirely preventable by a simply pre-election testing procedure. Why didn't the vendor tell the county? What about the other counties? Did they test and calibrate their machines properly and thus avoid problems? Or perhaps, some machines are more sensitive than others.

Did It Happen Before?

Orange County has had this scanner for quite some time, and yet county election officials seem to have been unaware of this problem. We wondered if the county had lost votes in past elections without detection.

We looked first at the 2004 general election. The following table shows the undervotes by mode of voting for the top races on the ballot. We have omitted the Congressional District 3 race because the incumbent did not have an opponent, only a write-in candidate. Uncontested races frequently have very high undervote rates.

Table 19. Undervotes by Voting Mode, Orange County, FL, 2004 General Election

	Election Day			Early Voting			Absentee Balloting		
Race	Ballots Cast	UV	UV%	Ballots Cast	UV	UV%	Ballots Cast	UV	UV%
Presidential	243,536	801	0.33%	79,171	249	0.31%	67,999	941	1.38%
U.S. Senate	243,530	4228	1.74%	79,171	1,348	1.70%	67,876	2,170	3.20%
CD - 8	145,019	9741	6.72%	44,889	3,078	6.86%	39,545	3,062	7.74%
Public Defender	243,536	20,507	8.42%	79,171	6,707	8.47%	67,753	7,862	11.60%

Note: CD-3 omitted because incumbent had no opponent other than write-in.

The difference in undervoting on absentee ballots is clear. In the presidential race, the absentee ballot undervote rate is more than 4 times the rate on election day or early voting ballots. In the U.S. Senate race, the undervote rates on early and election day ballots are very similar at 1.70 percent and 1.74 percent respectively, but the absentee ballot rate is nearly double those rates at 3.20 percent. The public defender's race shows the same trend.

As noted earlier, in other Florida counties, absentee ballot undervote rates do not seem to vary greatly from the rates on early voting and election day ballots cast on optical scanners. The 2004 state report shows that the rates are similar. The 2004 data tables also show that on the presidential race Orange County had the worst undervote rate on absentees of any county in Florida—just as it did in 2006. The only other counties with an undervote rate over 1 percent were extremely small counties where a only a handful of ballots were cast by absentee.

It seems clear that Orange County likely experienced the same problems in 2004 with uncounted votes due to a failure to calibrate its optical scanner properly to read low-carbon inks.

Orange County in 2000
As a part of its "Florida Ballot Project," the National Opinion Research Center (NORC) asked for the uncertified ballots from each of Florida's 67 counties. Orange County is listed by NORC as one of the "exceptional" counties by because it could not produce all the undervoted and overvoted ballots that were given in its official results. According to the NORC, the county could not produce more than 400 of the machine-rejected ballots because they were not distinguishable from the ballots counted by the machines; that is, there was no apparent reason why the machine failed to count the ballots. One of the possible reasons offered, at the time, for why the ballots might not have been counted is "low carbon content in the ink pens used to mark them," the same reason given for the uncounted ballots in 2006. [21] In response, Orange County rescanned all its ballots.

This gives us two important pieces of information: (1) Orange County's absentee ballot scanner was losing votes as early as the 2000 general election, and (2) Orange County elections officials were warned at the time about the problem.

2002—A Break in the Pattern
Data by voting mode from the 2002 election has been more difficult to obtain; however, some limited data are available in the state's overvote and undervote report on that election.[22]

Considering the problems in 2000 and 2004, we expected to find excessive undervotes on the absentee ballots in 2002 as well. This was not the case, however. In 2002, the undervotes on absentee ballots were normal.

Prospects for 2008 and After
The ES&S Op-Tech system is due to be phased out by 2009. Orange County has already purchased an entirely new voting system from ES&S, but both ES&S Op-Tech and Sequoia counties continued to use this scanner through the 2008 cycle. Clearly, this problem should be addressed by the state's Bureau of Voting System Certification. A system that habitually loses votes should be decertified and an alert to the counties issued immediately.

SEQUOIA AVC EDGE
The relatively poor performance of the Sequoia touchscreen system as the state's second-worst system in terms of election accuracy is easily overshadowed by the spectacularly bad performance of the iVotronics. Still, the system did not perform as well as any of the optical scan systems, including one that was admittedly losing large numbers of votes cast by absentee ballot.

We noted that the system in California that lost absentee votes was a Sequoia system so we immediately wanted to know if Florida's Sequoia voting system possibly had the same problem as the ES&S Op-Tech optical scan system in Orange County The Sequoia DRE-based system uses a slightly different model of Op-Tech scanner—the Op-Tech 400-C—for absentees.

[21] Lance Dehaven Smith, 2005, *The Battle for Florida: An Annotated Compendium of Materials from the 2000 Presidential Election* (University Press of Florida: Gainesville, FL), Chapter 2, Appendix, pgs. 66-67.
[22] Precinct-level results on the Orange County website do not show residual votes at all. We have requested this information from the Orange County Elections office and expect to receive it soon.

We soon discovered, however, that the difference is in name only. The 400-C and the IV-C are the same machine.

Table 20. Undervote Rates in Statewide Races for Counties Using Sequoia Edge Voting System, Florida 2006 General Election

Rank	County	Turnout	Sen UV%	Gov UV%	AG UV%	CFO UV%	COA UV%	Tot UV%
17 of 66	Palm Beach	371,368	1.55%	1.04%	2.49%	3.80%	3.54%	2.356%
35 of 66	Hillsborough	291,909	1.64%	0.58%	3.17%	3.88%	4.61%	2.775%
44 of 66	Indian River	43,898	1.95%	1.08%	3.40%	4.73%	4.85%	3.202%
45 of 66	Pinellas	294,632	2.22%	0.84%	3.42%	4.52%	5.24%	3.249%
	Total	1,001,807	1.79%	0.85%	3.00%	4.08%	4.41%	2.825%

The county rank shows that three of the four Sequoia counties had undervote rates that placed them in the lower half of Florida counties for election accuracy. In an interesting ironic twist, only Palm Beach, the county whose name became synonymous with lost votes, ranked well compared to other Florida counties with respect to undervotes. Palm Beach's cumulative undervote rate of 2.356 percent is substantially better than the 3.249 percent cumulative undervote rate in Pinellas County, which had the worst undervote rate of the four counties. Palm Beach also had the lowest undervote rates of the four counties in each of the individual contests, except the Governor's race. Pinellas had the worst undervote rate in all but the Governor's race.

What about Absentees?

The real question is whether the undervotes on absentees are higher than on election day or during early voting. We looked at the data tables from the state report again to see if absentee voting had higher rates of undervoting:

Table 21. Undervote Rates for Election Day and Early Voting Vs. Absentee Balloting, Sequoia Edge Voting System, Florida 2006 General Election

	U.S. Senate		Governor	
County	ED & EV UV%	AB UV%	ED & EV UV%	AB UV%
Palm Beach	1.62%	1.12%	1.07%	0.84%
Hillsborough	1.63%	1.62%	0.54%	0.77%
Indian River	1.98%	1.77%	1.12%	0.84%
Pinellas	2.30%	1.80%	0.85%	0.75%

Source: Analysis and Report of Overvotes and Undervotes for the 2006 General Election, January 31, 2007, Florida Department of State, Tallahassee, FL.

The above table shows clearly that undervotes on absentees were generally lower than during election day and early voting. As there is no disproportionate loss of absentee votes, there is no evidence to suggest any particular problems with their absentee ballot scanner.

Conclusions?

In all, it is hard to pinpoint the problems with the Sequoia system. It does not have undervote spikes that suggest catastrophic failures nor are there differences by voting mode that point

toward problems with specific equipment. Yet three of the four counties that used the system had election accuracy scores that were not dramatically poor, but consistently so. Of the four counties that use this system, one—Palm Beach—had levels of undervoting similar to those in optical scan counties. The other three counties are all in the bottom half of Florida counties with regard to election accuracy. Two of the three are in the bottom third.

With only four counties using this system, it is very difficult to extricate possible machine problems from county-specific factors. Without more research, it is impossible to determine what caused the elevated undervoting on this system.

DIEBOLD AND ES&S BLENDED SYSTEMS

Both the Diebold and ES&S optical scan-based systems performed well with respect to election accuracy, consisting outperforming both of the touchscreen systems in four of the five contests and in cumulative scores.

With only slightly more than 250,000 voters, the ES&S optical scan system was by far the smallest system in the state. For comparison, the next smallest system—the ES&S Op-Techs—served nearly 480,000 voters. Thus, the stellar performance of the ES&S blended system did not have much of an impact on the state.

In contrast, the Diebold (now Premier) system was used by more counties than any other system and was second only to the iVotronics in number of voters served—more than one and a half million. Thus, its good performance had a substantial impact on the state's overall undervote rate.