

## Why DREs Will Cause Long Lines, Why Paper Ballot-Optical Scan Can Eliminate Long Lines, and Why DREs Will Cost Even More than You Thought They Would

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I am here to support the resolution in favor of adopting paper ballots and optical scan. In particular, I am going to tell you why DREs will cause long lines, why paper ballot optical scan can eliminate those lines, and why DREs will be even more expensive than you thought.

Recently the New York City Board of Elections published a report suggesting that one DRE could replace each lever machine and serve 277 voters who show up at the polls. Here is their reasoning. They posit that each voter using a DRE with voter verified paper trail takes 3.25 minutes. They then divide a 15 hour election day (900 minutes) by 3.25 minutes and get 277 voters.

If we accept their figure of 3.25 minutes to vote, is it really possible for 277 voters to finish in a 15 hour day? No, it is not. 277 voters at 3.25 minutes each would only work if everybody arrived at precise 3.25 minute intervals. As you know, there are busy periods, such as early morning, lunch and dinner, when people come at a higher rate than average, and other slack periods. At all times, people come randomly. Sometimes many more than average will come, sometimes many less.

Here is what the NYC report said about this:

On Election Day, there are "peaks and valleys" of usage by voters depending upon the time of day, the weather, traffic and other variables outside of the control of election staff. Thus there will always be times when voters are waiting, but on the whole, there should be some insurance that waits will not be over long durations throughout the day and that on the whole, voting can be accomplished expeditiously. If we make the assumption that on the whole elections are conducted expeditiously by the survey jurisdictions, than [sic] a maximum that is at, or somewhat higher than, the average by type of technology should be a reasonable maximum for New York.

Unfortunately, this is just unsupported wishful thinking. The flow of voters is governed by the mathematics of queuing theory. I have applied this mathematical approach to simulate elections in districts with 1, 2 or 4 DREs and will tell you that in 80% of elections there will be people waiting over 1 hour to vote. There will be many polling places in which voters are kept waiting even longer.

This is not just mathematics—long lines with DREs have been endemic to that technology. There were several-hour long lines in Ohio in 2004, there were long lines in the recent Ohio primaries in September 2006, and there were long lines in the Maryland primaries in September 2006.

Is there a cure for this problem? Yes, buy more machines—many more machines. But you can't afford to do that.

The picture for paper ballot optical scan is very different. It is easy and inexpensive to buy marking booths for PBOS. Marking booths represent the same potential bottleneck for voter flow as do the DREs. The difference is that the marking booths cost less than \$200 each, and the DREs cost \$8,000 each.

Let's look at two PBOS examples. Lee, MA had 3200 voters in the 2004 general election served by a single scanner. They had 35 marking booths for a 13-hour day. In other words, 91 voters per marking booth. This is equivalent to 105 voters per booth for a 15 hour day.

In the documentary "Bought and Sold" by Robert Millman, the Lee town clerk Susan Scarpa said there were no lines to use the marking booths. They previously had 8 lever machines with, as described by Ms. Scarpa, "long, long lines." So 8 lever machines were replaced by 35 marking booths.

I spoke to the town clerk in Londonderry, NH. They had 12,000 voters in the 2004 general election served by two scanners for a 13-hour election day. They had 100 marking booths and no lines. So that is 120 voters per booth. This is equivalent to about 140 voters in a 15 hour day. She told me that some periods of the day have people in only a few booths, and busy times have 90% of the booths occupied.

So here you have two examples that work. They are equivalent to 105 and 140 voters/per marking booth in a 15 hour day. These figures are less than 1/3 the number of voters per DRE suggested by the NYC Board of Elections when a possible high voter turnout is taken into account. Lee, MA and Londonderry, NH do not have lines at their marking booths. Ohio and Maryland have had long lines at their DREs, big time. Many voters gave up trying to vote. This amounts to disenfranchisement.

I have not discussed the effects of DRE breakdown (roughly 10% in recent elections) or the effect of voters with special needs taking an average of 30 minutes each to use machines with disability aids, as indicated by recent tests conducted by the NY State Board of Elections. These factors will further exacerbate waiting times.

This brings us to cost. Are you prepared to buy 3 DREs for each lever machines you now own? As an Albany County taxpayer, I hope not. But that is what you need to do to make the voting process run efficiently.

What I hope, instead, is that you will opt to think of the voters first and get what works for us.

In summary, DREs and marking booths for paper ballots represent the same bottleneck for voting. With paper ballots, buying more marking booths is effective and inexpensive. You will not be able to buy enough DREs to reduce lines at all polling places because of DRE cost.