Introduction:

- We have been developing an integrated Paper-ballot & Electronic Ballot System for Pacifica's 2010 Election.
- This model is presented visually. See Paper Ballot & Electronic Ballot System Model (page 2)
- For a step by step description see Paper Ballot & Electronic System - Step by Step (page 3)
- Both paper and electronic ballot system have problems. The integrated system would minimize the problems associated with either method. See page 3 for a discussion of problems and solutions
- Before this model is implemented, we would have you test a pilot.
- Compared to last year's budget ($**83 392** spent on printing and mailing not including WBAI's reissue), we will save about **$54 670** on printing, mailing and manual labor costs by using this method.

2009 MAILING and PRINTING COST*
INKWORKS - 69 392.32
DIRECT MAIL - 14 000.00
TOTAL - 83 392.00

*not including re-printing and re-mailing for WBAI in 2009

2010 PAPER BALLOT plus ELECTRONIC BALLOT ESTIMATES	KP GRAPHICS		
Items	**Quantity (65 000)**	**Quantity (15 000)**	**Quantity (80 000)**
#10 window eps	2367	640	
Letter with STV, Electronic Ballot, & Paper Ballot Request	3775		
Lettershop	2210	1035	
#9 CRE (courtesy reply env.)	0	775	
Ballot sheets		1500	
16pp booklets		2900	
Postage additional (standard non profit, 16.9 cents per unit)	10,985	2,535	
TOTAL	19,337	9,385	**28,722**

Image 1: Integrated Paper Ballot & Electronic Ballot System Model

August 16th, 80 000 Ballots are sent
Paper & Electronic
Cost: $28 722 (2010)
vs $83 892 (2009)

Paper Ballot Package including:
STV Instructions, Paper Ballot with Unique Pin (Barcode) & Full Candidate Statement Booklet & Courtesy Reply Envelope
Electronic Ballot Instructions
Quantity = 15 000 | Cost = $9385

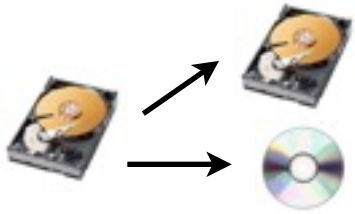
Electronic Ballot Letter including:
STV Instructions, **Electronic Ballot Instructions** & **Paper Ballot Request** methods
(1-800 number, fax, mailing address, email, online form)
Quantity = 65 000 | Cost = $19337

Voter Sends Envelop w/Ballot to POBOX

Submitted Ballot Jpeg Images stored on server, stored by all individuals submitting virtually, and automatically Backed Up to NES Hard Drive. NES Hard Drive Backed Up to a second Hard Drive and burned to data CDs daily, secured in the storage unit by election supervisor and 3 witnesses*

Envelops w/Ballots collected, counted, secured from POBOX to locked storage unit by election supervisor and 3 witnesses*

Electronic Ballot Instructions
- Point to Secure Pacifica Server URL
- Unique Login Information
- Username: Membership Account #
- Password: Unique Pin which is also the paper ballot barcode (9 digit random number)
- **Virtual Ballot Saved as Jpeg (Pin number = Barcode embedded into image)**

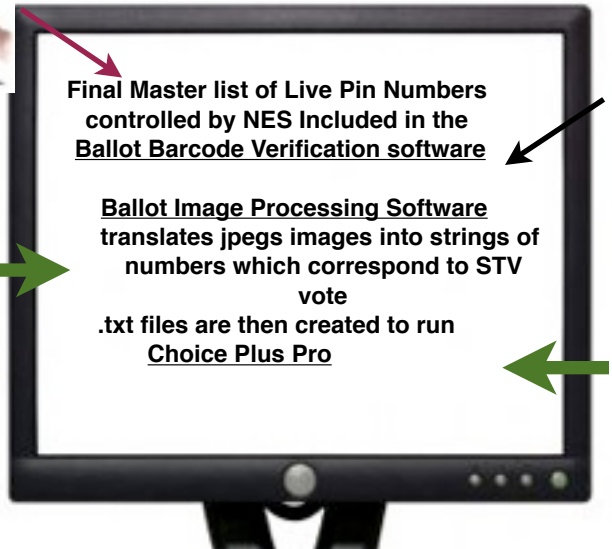


8 am October 1st, Final Paper Ballot pick up from POBOX secured in storage unit

12 midnight EST, CDT, PST Final Electronic Ballot Submissions Accepted & backed up to Hard Drive and Disks and secured in the storage unit

Public Location For Ballot Count (OCTOBER)

- **Paper Ballot Processing**
- Envelopes Opened
- Ballot Barcodes scanned and entered into the **Ballot Barcode Verification software**
- Sorted into Accepted and Rejected Ballots
- **Accepted ballots are scanned fully and become .jpeg files**
- **Accepted ballots .jpeg files are submitted to Ballot Image Processing Software**
- Rejected ballots can then be investigated on a case-by-case basis in order to find you why the ballot barcode (pin) was rejected



Final Master list of Live Pin Numbers controlled by NES Included in the Ballot Barcode Verification software

Ballot Image Processing Software translates jpegs images into strings of numbers which correspond to STV vote

.txt files are then created to run Choice Plus Pro

- **Electronic Ballot Processing**
- Stored Hard Drive and CDs are verified for accuracy by comparing jpeg files on CDs with jpeg files Hard Drive with jpeg files stored on the server
- Any voter present with a record of their ballot (jpeg image) can search for a ballot jpeg image to be located as the jpeg will be stored under the unique PIN number
- List of ballot pins (the barcodes) will be entered into the **Ballot Barcode Verification software**
- Sorted into Accepted and Rejected Ballots
- **Accepted ballots .jpeg files are submitted to Ballot Image Processing Software**
- Rejected ballots can then be investigated on a case-by-case basis in order to find you why the ballot barcode (pin) was rejected

Paper Ballot & Electronic System - Step by Step

0. Approximately 15 000 paper ballots (ballot and candidate package) and 65 000 electronic ballots (a letter with instructions, unique pin etc) would be mailed out. The 15 000 who would get the paper ballot default would based on the list of people who voted last year who voted in last year's election are who are more likely to need the traditional ballot. Note anyone who received an e-ballot and would need a paper ballot would just need to request one.
1. Voting members will be sent a letter which includes e-voting instructions & paper ballot request instructions (contact information 1800 number, address and fax to get a paper ballot & candidate packages)
2. The instructions will include a URL where the member will login to a secure site using their membership number (aka "username") and their unique pin (aka "ballot barcode")
3. Once they login they will be presented with a tutorial on how to fill out their ballot (either simple instructions or an actual animation)
4. They have the option to skip these instructions and jump to casting their vote
5. The virtual ballot interface will look exactly like the paper ballot
6. It will include the pin number in the lower right hand corner of the ballot and be associated to a barcode image (only symbolic in purpose).
6*. The pin will state with 2 letters which define the station and if the ballot is listener or staff (eg. KPFA Listener pin would be AL092837569 - KPFA Staff pin AS908475637)
7. They can rank the candidates by simply by using the mouse to click the box associated to the position desired
8* The candidate names will be hyperlinks which lead to their candidate questionnaires, statements and bios
8. They will be able to create any pattern of choices EXCEPT they will only be able to rank any individual candidate once (can't check position 2 and position 7 for candidate X - as this makes no sense)
9. They will be able to save their vote prior to submitting (a little button at the bottom for "save")
10. They will be able to logout and come back to continue their vote.
11. Their will be an option to receive an email notification if they have not submitted their vote and would like to be reminded (optional)
12. Once they submit (little button "Cast your Vote") they will no longer be able to make changes
13. When they submit they have the option to print out and save as a jpeg
14. Once the ballot is submitted it will be saved on the server as a jpeg
15. The name of the jpeg will be the ballot pin (or ballot barcode)
16. If they have made any errors and they would like the opportunity to resubmit they can simply contact the national election supervisor who will control the list of live barcodes
17. Come the count day **Paper Ballot & Electronic Ballots will be processed**

- **Paper Ballot Processing =** Envelopes Opened
- Ballot Barcodes scanned and entered into the **Ballot Barcode Verification software** which compares the Barcode (pin number) to the Final Master List of Live Barcodes submitted by the NES who keeps track of all reissues to prevent duplicate votes
- Sorted into Accepted and Rejected Ballots
- **Accepted ballots are scanned fully and become .jpeg files**
- **Accepted ballots .jpeg files are submitted to Ballot Image Processing Software**
- Rejected ballots can then be investigated on a case-by-case basis in order to find you why the ballot barcode (pin) was rejected
- **Electronic Ballot Processing**
- Stored Hard Drive and CDs are verified for accuracy by comparing jpeg files on CDs with jpeg files Hard Drive with jpeg files stored on the server
- Any voter present with a record of their ballot (jpeg image) can search for a ballot jpeg image to be located as the jpeg will be stored under the unique PIN number
- List of ballot pins (the barcodes) will be entered into the **Ballot Barcode Verification software**
- Sorted into Accepted and Rejected Ballots
- **Accepted ballots .jpeg files are submitted to Ballot Image Processing Software**
- Rejected ballots can then be investigated on a case-by-case basis in order to find you why the ballot barcode (pin) was rejected

18. All Accepted Ballots .jpegs of paper and of electronic ballots are combined
19. The virtual ballot jpegs and the scanned paper ballots will be processed by **Ballot Image Processing Software** which translates images into strings of numbers corresponding to a given voter's ballot choices
19. The strings of numbers together with the other files needed to run Choice Plus Pro will be created
20. Choice Plus Pro will run the STV calculation
21. Results, raw ballot files (jpegs) will be made publicly available
22. Individuals will be able to verify their virtual vote by searching for their virtual ballot (their pin number is the jpeg name, pin number embedded into the jpeg image, symbolically associated to the barcode)

Potential problems with mail-in and electronic voting:

Both forms of voting have potential problems, but we can take steps to minimize them. Real problems arise when (as with some electronic voting systems used in national, state, and municipal elections) no real steps are taken to deal with these matters such as fraud, secret/proprietary software, unverifiability of votes, etc. Paper ballot boxes also have a very long and unfortunate history of fraudulent ballots getting counted.

Paper ballot voting has some disadvantages that electronic voting does not have, and that's why we want to give Pacifica members a choice in how they vote.

Paper ballots can be lost (either in the mail going to or from a member, or at the home of a member) and might not be replaced in time if only discovered at the last minute.

Paper ballots can be fraudulently padded with improper ballots if steps are not taken to ensure that duplicates are not allowed, if only a single person collects ballots from the PO box with no oversight, etc.

Some paper ballots in every Pacifica election have also been unclear as to a voter's choice, when for example a voter mistakenly marks a choice he/she does not want and does not make it clear what his/her real choice is. (An example might be to rank a particular candidate both 1st and 10th, with no notes written on the ballot how with the election supervisor know which ranking the voter wants?)

Here are some ways we'll be able to verify ballots and prevent problems at least as well as with all-paper voting, and in a much more thorough manner than with national electronic voting systems:

* We'll validate that the voter is a member.
* We'll validate that each voter can vote only once (paper or electronic).
* We'll use a secure connection (SSL) to the web server used for voting, and voting will NOT be by e-mail (which is inherently insecure).
* Immediately after a member votes online, he/she will get a confirmation number/ballot code and instructions to save that number so the ballot can be verified later if desired.
* We'll publicly post all ballot images on a web site, with the ballot identifier/ID/bar code number as part of file name to make it easy for any voter to verify that his/her ballot was received.
* We'll publicly post all output files of the ballot scanning/processing software, in a text file with each record associated with ballot number/ID/bar code (input to Choice Plus Pro). This allows anyone to verify that the ballot image (from the previous step) was properly processed and the voter's choices were identified correctly by the software (or manually in case of ambiguity).
* We'll publicly post all output files from Choice Plus Pro (the software which takes the text files above with ballot information, and performs the STV counting of them) - round by round election results will be posted.
* We'll use open source software, and publicly post it, for both the ballot image processing software, and for the vote counting software (Choice Plus Pro) so that anyone with a computer programming background can verify that software is correct, and in fact can even duplicate the vote counting using the publicly posted ballot images.
* We'll make frequent backups of files, and with each ballot also stored on two different disk drives as soon as a member votes.
* Although highly unlikely that we will need this we will have a plan B if we are hacked by setting up the online voting system on a second secured served in case we are victim to a *distributed denial-of-service* (DDoS) *attack*.