

**RANKED CHOICE VOTING ISSUES GROUP  
TECHNICAL ADVISORY COMMITTEE REPORT  
January 31, 2008**

The Technical Advisory Committee (TAC) of the Ranked Choice Voting (RCV) Issues Group has completed its study of RCV equipment options. The report which follows explains methodology and findings, and outlines equipment acquisition issues to be considered prior to implementation of an RCV voting system.

## **I. PURPOSE OF STUDY**

The Technical Advisory Committee conducted a study of existing options for equipment, technology and certification related to implementation of Ranked Choice Voting. The core mission of RCV Issues Group is to propose standards which can be applied statewide in Minnesota. Though much of the TAC's discussion focused on the Hennepin County/City of Minneapolis voting equipment system, it is important to note that similar arrangements for election equipment sharing are typical of Minnesota cities and counties. Our analysis of equipment options should be viewed in this larger context.

Participants in the committee were:

- Tim Bonham, Minneapolis DFL
- Peter Brickwedde, Minnesota Senate Staff
- Dani Connors-Smith, City of Minneapolis Elections
- Michelle DesJardin, Hennepin County Elections & Voter Registration
- Jim Genelli, City of Hopkins
- Robin Garwood, Minneapolis Ward 2 City Council Aide
- Mark Halvorson, Center for Election Integrity
- Ben Hecker, Minneapolis Ward 13 City Council Aide
- Fran Hesch, City of Hopkins Charter Commission
- Representative Bill Hilty
- Andrea Jenkins, Minneapolis Ward 8 City Council Aide
- Bruce Kennedy, Roseville attorney
- Dag Knudsen, FairVote Minnesota
- Andy Lokken, Office of the MN Secretary of State
- Kirk Lund, Center for Voting Integrity
- Senator John Marty
- Jeanne Massey, FairVote Minnesota
- Patty O'Connor, Blue Earth County Auditor's Office
- Gary Poser, (Co-Chair) Office of the MN Secretary of State
- Cindy Reichert, (Co-Chair) City of Minneapolis Elections
- Rebekah Smith, Minnesota House of Representatives Staff
- Doug Sunde, Synergy Graphics
- David Weinlick, FairVote Minnesota/Minnesota DFL Party
- Josh Winters, Minnesota Council of Nonprofits

Our process included:

- (1) Identification of equipment options for study
- (2) Consideration of criteria that would be used to evaluate each option
- (3) Demonstrations by and discussions with equipment vendors
- (4) Discussion and consensus building within the TAC itself

## II. OVERVIEW OF ISSUES

Prior to conducting a ranked choice election, several technical and political issues regarding equipment development and acquisition need to be addressed. An increasing number of jurisdictions around the U.S. have adopted or are contemplating adoption of Ranked Choice Voting, and voting equipment systems remain the primary obstacle to implementation, especially in large jurisdictions where a hand-count is not feasible. At the time of this report, no Ranked Choice Voting equipment system has received federal certification, a requirement under MN law. Most jurisdictions outside Minnesota that operate RCV elections use equipment that is not federally certified, or conduct a hand count to determine results.

Major voting equipment manufacturers are operating in a decidedly unsettled environment. Increased scrutiny of elections and election equipment has resulted in a series of mandated changes to the industry including the required addition of voter verified paper trails to DRE machines, the move away from DRE to paper ballot systems, Federal ADA accessibility requirements, etc. With the adoption of the Help America Vote Act (HAVA) came the creation of the Election Assistance Commission (EAC) and new standards for certification. The Election Technology Council, a trade association of voting system manufacturers, maintains that changes to the federal certification process have increased the timeline for new product development and implementation to approximately 54 months: 18 months for Research and Development; 18 months for State and Federal certification; 12 months for Production and Delivery; and 6 months for Training and Election Preparation.<sup>1</sup>

Given this unsettled environment, vendors are reluctant to divert resources to the development of RCV equipment citing a relatively small demand in the market. The lack of consistent standards and rules between jurisdictions result in the need to create customized programs for each jurisdiction. Increased interest in RCV systems is beginning to change the landscape, however, and vendors are becoming more aware of the need to meet future market demand. Already, one vendor has submitted an application to the EAC for certification of an RCV system for use in San Francisco and Pierce County, Washington in November 2008.

Political considerations regarding budgets, contracts, approvals and timelines impose additional requirements for jurisdictions considering implementation. In Minnesota voting equipment systems are generally owned and operated by counties. System replacement is typically managed through a normal replacement schedule that may, or may not, coincide with an RCV implementation schedule. In all cases, cities that choose to conduct RCV elections need to work with their County Auditors to ensure compatibility issues are addressed. Counties may be reluctant to invest in new equipment needed by only a few of their member cities. Given the potential cost and associated administrative responsibilities, cities may be reluctant to purchase entirely new voting equipment systems independent of the county system in which they operate.

None of these challenges are insurmountable, but do require the investment of time, money, and coordination between election partners, vendors, and public officials. Though the TAC is not able to recommend an electronic solution to MN jurisdictions wishing to implement Ranked Choice Voting immediately, our study does provide a solid information base for jurisdictions to consider as they move forward in the development and acquisition process.

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<sup>1</sup> <http://www.electiontech.org>

### III. VOTING SYSTEM CERTIFICATION

The TAC considered three certification scenarios:

- A. Federal/State Certification
- B. Independent State Certification
- C. Experimental System Certification

#### A. Federal/State Certification

Minnesota State law requires that in order to receive certification in the State of Minnesota all electronic voting systems must be certified by an independent testing authority (ITA) approved by the Secretary of State, and must conform to current standards for voting equipment issued by the Election Assistance Commission.<sup>2</sup>

Voting System is defined by the EAC as “The total combination of mechanical, electromechanical, and electronic equipment (including the software, firmware, and documentation required to program, control, and support the equipment) that is used to define ballots, cast and count votes, report or display election results, connect the voting system to the voter registration system, and maintain and produce any audit trail information.”<sup>3</sup>

Our own state law defines Voting System as a system in which “the voter records votes by means of marking a ballot, so that votes may be counted by automatic tabulating equipment in the polling place where the ballot is cast or at a counting center. An electronic voting system includes automatic tabulating equipment; non-electronic ballot markers; electronic ballot markers, including electronic ballot display, audio ballot reader, and devices by which the voter will register the voter's voting intent; software used to program automatic tabulators and layout ballots; computer programs used to accumulate precinct results; ballots; secrecy folders; system documentation; and system test results.”<sup>4</sup>

It is important to note that examination by the EAC of a voting system requires that all components of the voting system be submitted for examination and certification together as a package. The EAC does not certify individual components – only complete voting systems.

EAC certification is required for:<sup>5</sup>

- (1) new systems not previously tested to any standard;
- (2) existing systems not previously certified by the EAC;
- (3) previously certified systems that have been modified;
- (4) systems or technology specifically identified for retesting by the EAC; or
- (5) previously certified systems that the Manufacturer seeks to upgrade to a higher standard (e.g., a more recent version of the VVSG).

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<sup>2</sup> [Minn. Stat. §206.57, subd. 6.](#), [Minn. Stat. §206.58, subd. 1.](#), [Minn. R. 8220.0325](#), and [Minn. R. 8220.0350](#) (L)

<sup>3</sup> [Election Assistance Commission Testing and Certification Program](#) Manual, Version 1.0, effective January 1, 2007

<sup>4</sup> [Minn Stat. §206.56 subd. 8](#)

<sup>5</sup> [Election Assistance Commission Testing and Certification Program](#) Manual, Version 1.0, effective January 1, 2007

Modification is defined by the EAC as “Any change to a previously EAC-certified voting system’s hardware, software, or firmware that is not a de minimis change. Any modification to a voting system will require testing and review by the EAC”. De Minimis Change is defined as “A change to a certified voting system’s hardware, the nature of which will not materially alter the system’s reliability, functionality, capability, or operation. Software and firmware modifications are not de minimis changes.”<sup>6</sup>

As a result of these certification requirements, any modification proposed to any component of a Voting System currently certified in Minnesota will result in the need for the entire system to go through the complete Federal and State certification process. The re-certification process applies to Options 1(C), 1(D), 2(E) and 2(F) presented in Section IV of this report.

Two other scenarios presented in Section IV, Options 1(A) and 1(B), include the addition of scanners and software to be used at a central count center to count ballots and determine the winners of RCV races. Under these two scenarios no modifications are proposed to the already certified precinct count system. In these cases the central count systems are considered to be completely separate from the precinct count equipment systems already certified. Therefore, the central count systems identified in Options 1(A) and 1(B) may be certified as separate systems.

Current estimates of the time needed for certification through the Federal Election Assistance Commission are between 12 and 24 months, dependent on the scope of the change. Following Federal certification, the State certification process would take approximately 1 – 3 months. The Secretary of State does not examine or certify voting systems in state election years.<sup>7</sup> Therefore, MN state certification on any system can only be granted in odd years (2009, 2011, 2013, etc.).

The estimated timeline for approval under Federal/State process would therefore be 13 – 27 months following date of application to the EAC. This timeline does not include time needed for product development or production.

## **B. Independent State Certification**

Minnesota State law requires a voting system to “conform to standards” issued by the EAC. Theoretically, a vendor could request that our own SOS approve an ITA to test to the Federal standards as an alternative to the Federal certification requirement which may shorten the time period for certification to take place.

An independent State certification process has not previously been contemplated, nor has the OSS made plans to establish this process. The Office of the MN SOS does not possess the technical expertise needed to reproduce work normally done at the Federal level and management of a strictly state level process would require changes in the structure of the department that would take time to put into place.

An independent State process would require conformance to the same technical standards as the Federal/State certification process, and will limit the vendor to market their product only through sales in Minnesota. Completion of the Federal/State process would allow the vendor to market their product anywhere in the U.S.

The timeline for approval under an independent State process is difficult to estimate.

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<sup>6</sup> [Election Assistance Commission Testing and Certification Program](#) Manual, Version 1.0, effective Jan 1, 2007

<sup>7</sup> [Minn. R. 8220.0325](#)

### C. Experimental Voting System Certification

Minnesota State law also allows for use of an experimental system.<sup>8</sup> The Office of the Secretary of State recently inquired of the State Attorney General as to the process through which an RCV voting system can be approved for experimental use. In her reply, the Attorney General stated that the Office of the Secretary of State has not adopted rules governing the certification of experimental use and further recommended that the OSS pursue rulemaking before certifying any equipment under this process. Rules would need to address the criteria on which certification would be based, and define what a testing authority would have to test. The rulemaking process is long and labor intensive. The OSS has stated that rulemaking for this process cannot begin until after the 2008 election.

Under this option, rulemaking would take approximately 12 months following the 2008 election. This timeline does not include product development or production, and does not include time needed for regular certification outside the experimental use environment.

### III. METHODOLOGY FOR ANALYSIS OF RCV VOTING EQUIPMENT OPTIONS

The TAC viewed equipment demonstrations from two vendors; Election Systems and Software (ES&S) and TrueBallot, Inc. In addition to the demonstrations, written comments were received from Sequoia Systems and Premier Election Systems (formerly Diebold) declined to participate. Though Premier's development team has put together a preliminary outline of the process needed to create an RCV application, they have not yet set a date for starting development activities. Premier's management has directed that they wait until guidelines and standards are released at a federal level. Another factor contributing to their delay is the relatively small demand from their user base for RCV software.

An RCV equipment system must be able to perform these basic functions; read ballots; provide voter error notification, count ballots, create and store a ballot record, perform vote transfers, and produce results. Each equipment option identified would perform these functions using various configurations of system components. Several equipment configurations were identified:

**Option 1: Precinct count equipment currently in use in Minnesota, in conjunction with other components**

- A. Unmodified ES&S M100's with ES&S 650 Central Scanner and ES&S RCV software
- B. Unmodified ES&S M100's with TrueBallot independent central scanner and RCV software
- C. Modified ES&S M100's with ES&S RCV software
- D. Modified ES&S M100's with TrueBallot Independent RCV software

**Option 2: Precinct count equipment not in use in Minnesota, alone or in conjunction with other components**

- E. ES&S DS200
- F. Sequoia Systems

**Option 3: Existing RCV Capable Equipment - This option immediately discarded as vendors no longer support the technology**

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<sup>8</sup> [Minn. Stat. §206.58](#)

After component configurations were identified, each variation was evaluated considering these criteria:

Number of rankings allowed – A minimum of three rankings is required

Flexibility of ballot design options – Though ballot design is yet to be determined, flexibility in design options is preferable.

Ability to use concurrently with other elections (Fed, State, etc.) – Any system must be able to run concurrently with other, non-RCV elections, that may appear on the ballot.

Speed and method of returning results – Expectations for results reporting are high. An equipment system that compiles and reports RCV results quickly is preferable.

Ability to provide error notification to voters – Voters in the polling place must be allowed an opportunity to be informed of errors in marking their ballot and provided with an opportunity to make corrections.

Ability to operate within existing election systems – Most local jurisdictions operate within larger equipment systems (i.e., many cities operate within a county-owned election system).

Ability to integrate with assistive voting equipment (AutoMARK) – The only piece of AVT equipment currently certified in the State is the AutoMARK. AutoMARKS are required by law to be available in every polling place in the state and must be able to be programmed to display and mark an RCV ballot.

Research & Development Needed – Most options will require some research and development activities to be undertaken.

Certification Considerations – System certification is required in all cases. Estimated length of the process was considered

Timeline – Time between selection of an equipment system and proposed implementation was considered.

Cost – Cost to the public is a consideration.

**V. ANALYSIS**

**Option 1 (A) Precinct:** Unmodified M100 - Count first choices, provide error notification  
**RCV Center:** Modified ES&S 650 central scanner – Count ballots, create/store ballot record  
 New ES&S RCV software – Perform vote transfers and produce results

**Option 1 (B) Precinct:** Unmodified M100 – Count first choices, provide error notification  
**RCV Center:** TrueBallot Independent Central Scanner – Read and Count Ballots, create/store ballot record  
 TrueBallot Independent RCV Software - Perform vote transfers and produce results

Criteria	Evaluation 1 (A)	Evaluation 1 (B)
Number of rankings allowed	Limited to three across columns Unlimited if organized vertically Tested to three	Same
Ability to provide error notification to voters	Overvote and undervote error notification within each column No notification of skipped or repeat rankings possible (Additional information from ES&S expected Jan 31)	Same
Flexibility of ballot design options	Bubbles Three column format (or vertical)	Same
Ability to use concurrently with other elections (Fed, State, etc.)	Can be programmed to run all elections concurrently	Same
Speed and method of returning results	1st choice results at precinct Requires re-scanning of all RCV ballots RCV vote transfers can be done quickly following scan	Same
Ability to integrate with County System	May require re-negotiation of County/City/Vendor contract County Board approval may be required	Same – may require contractual agreement between ES&S and Independent RCV Software owner
Ability to integrate with assistive voting equipment (AutoMARK)	Error notification within each of the three columns can be programmed No error notification between columns possible Voter will see one column (choice) at a time Alternatively, choices can be displayed in vertical format	Same
Research & Development Needed	Modification of ES&S 650 Central Scanner required ES&S RCV software not yet developed	Independent scanner and software already developed

Criteria	Evaluation 1 (A)	Evaluation 1 (B)
Certification Considerations	Recertification of ES&S 650 Central Scanner required Certification of ES&S RCV software required	Independent scanner and software requires certification
Timeline	Adoption of rules/procedures RFP/Contract negotiation process Development of RCV software (ES&S) EAC application process 3 to 4 months Testing by ITA and assignment of Fed Certification number 12 to 24 months State Certification – Odd years only (Minn. R. 8220.0325) 1 to 3 months	Same – Independent RCV scanner and software does not require development, but does need to go through certification process Vendors may find it desirable to enter into contractual agreements
Cost	Per ES&S “Close to same as upgrades to M100” (option 1A - \$350,000 upfront costs; \$32,240 in recurring annual fees) plus purchase of ES&S 650 at approx. \$45,000	\$70,000 - \$110,000 per election

**Option 1 (C) Precinct:** Modified M100 - Read ballots, provide error notification, create/store ballot record

**RCV Center:** New ES&S RCV Software – Perform vote transfers and produce results

**Option 1 (D) Precinct:** Modified M100 - Read ballots, provide error notification, create/store ballot record

**RCV Center:** New TrueBallot Independent RCV Software – Perform vote transfers and produce results

Criteria	Evaluation 1 (C)	Evaluation 1 (D)
Number of rankings allowed	Limited to three across columns Unlimited if organized vertically	Same
Flexibility of ballot design options	Bubbles Three column format (or vertical)	Same
Ability to use concurrently with other elections (Fed, State, etc.)	Can be programmed to run all elections concurrently	Same
Speed and method of returning results	1st choice results at precinct RCV vote transfers can be done quickly using data from memory cards	Same

Criteria	Evaluation 1 (C)	Evaluation 1 (D)
Ability to provide error notification to voters	<p>Overvote and undervote error notification within each column</p> <p>If the M100 and corresponding Unity operating system is upgraded to Unity 4.0, the system could be programmed to provide error notification of skipped rankings. No option for identifying repeat rankings across columns.</p> <p>(additional information from ES&amp;S expected Jan 31<sup>st</sup>)</p>	Same
Ability to integrate with County System	<p>Requires re-negotiation of County/City/Vendor contract</p> <p>Requires recertification of County System</p> <p>County Board approval required</p>	Same
Ability to integrate with assistive voting equipment (AutoMARK)	<p>Error notification within each of the three columns can be programmed</p> <p>No error notification between columns possible</p> <p>Voter will see one column (choice) at a time</p> <p>Alternatively, choices can be displayed in vertical format</p>	Same
Research & Development Needed	<p>Modification of M100 required to capture ballot records, modify ballot layout system, election definition system, additional memory capacity for the use of multiple PCMA cards for capturing RCV images and for the election definition</p> <p>May not be possible to provide firmware capacity for both RCV and wireless transfer code to operate within the unit</p> <p>ES&amp;S RCV software not yet developed</p>	Same with one exception - Independent software has been developed
Certification Considerations	<p>Modified M100 and new RCV software trigger new Federal and State recertification process</p> <p>M100's designed to 2002 standards – uncertain whether Fed Cert could be granted under 2005 standards</p> <p>ES&amp;S has no plans to upgrade M100 unless contracted to do so</p>	Same - Independent software must also be certified
Timeline	<p>Adoption of rules/procedures</p> <p>Contract negotiations</p> <p>Redesign of M100</p> <p>Development of RCV software (ES&amp;S)</p> <p>EAC application process 3 to 4 months</p> <p>Testing by ITA and assignment of Fed Certification number 12 to 24 months</p> <p>State Certification – Odd years only (Minn. R. 8220.0325) 1 to 3 months</p>	<p>Same – Independent RCV software does not require development, but does need to go through certification process</p> <p>May require contractual agreement between ES&amp;S and Independent RCV Software owner</p>
Cost	<p>Firmware upgrade – \$200,000; Firmware license increase – \$5,200/year; Software upgrade – \$150,000; Software license increase – \$27,000/year plus cost of M100 upgrade to meet 2005 federal standards (unknown amount)</p> <p>Accurate costs can only be completed when the project is finalized including contractual negotiations and commitments which are agreed upon by all parties.</p> <p>Some cost sharing with other jurisdictions may be possible</p>	Same with exception of price of software - Amount less under 1 (B)

**2 (E) Election Systems and Software RCV Package**

**Precinct:** New ES&S DS200 Precinct Scanner - Read ballots, provide error notification for multiple rankings, create/store ballot record

**RCV Center:** New ES&S RCV Software – Perform vote transfers and produce results

**2 (F) Sequoia Systems**

**Precinct:** Sequoia Insight Precinct Scanner - Read ballots, provide error notification for multiple rankings, create/store data file

**RCV Center:** Sequoia RCV Software – Perform vote transfers and produce results

Criteria	2 (E)	2 (F)
Number of rankings allowed	Unlimited	Three
Flexibility of ballot design options	Intelligent Character Recognition – can combine different elections on same ballot paper	Target position only (arrows) Three column design Separate ballot card for RCV elections required
Ability to use concurrently with other elections (Fed, State, etc.)	Can be programmed to run all elections concurrently	Can be programmed to run all elections concurrently Separate ballot cards required for RCV and Non-RCV races
Speed and method of returning results	1 <sup>st</sup> choice results at precinct RCV vote transfers can be done quickly	1 <sup>st</sup> choice results at precinct RCV vote transfers can be done quickly
Ability to provide error notification	Full error notification across or within each column possible	Full error notification within or across columns possible
Ability to integrate with County System	Will require re-negotiation of County/City/Vendor contract May requires recertification process of County System County Board approval may be required New code base on the DS200 offers opportunity to program RCV, but causes incompatibility with county M100's Possibility of separate systems in one polling place – requires 2 optical scan and 2 AutoMARKS (increases number of machines in each PP from 1 to 4)	Does not integrate with County System May require recertification of County system May require renegotiation of City/County contract County Board approval may be required Possibility of separate systems in one polling place – requires 2 precinct scanners and 2 AutoMARKS (increased number of machines in each PP from 1 to 4)
Ability to integrate with assistive voting equipment (AutoMARK)	Error notification can be programmed within each of the three columns No error notification between columns possible Voter will see one column at a time DS200 offers option of acting as HAVA compliant DRE (Requires multiple units in precinct and statute change to allow)	Error notification within each of the three columns can be programmed No error notification between columns possible Voter will see one column at a time

Criteria	2 (E)	2 (F)
Research & Development Needed	ES&S changing current code base of DS200 to Java Graphical User Interface prior to developing RCV component DS200 is ES&S "go-forward" product. ES&S prefers to build RCV into new platform	Rules and Procedures (standards) must be in place prior to beginning R&D activities Multiple Seat program not yet developed
Certification Considerations	Addition of DS200 component may require Federal and State recertification of Hennepin County voting system DS200 has passed hardware level testing for 2005 standards	Single Seat election system currently undergoing certification process Addition of Multiple Seat program will require new Federal and State certification process
Timeline	Activities to be undertaken: Adoption of rules/procedures RFP Process/Contract negotiations Development of RCV software (ES&S) EAC application process 3 to 4 months Testing by ITA and assignment of Fed Certification number 12 to 24 months State Certification – Odd years only (Minn. R. 8220.0325)	Same – except development of multi-seat software needed
Cost	Moving into the DS200 may spread costs out over entire US – not just MN Each DS200 unit costs approximately \$6000 (need one for each polling place) Software development costs unknown	Alameda County Contract - \$13.5 M - Precinct equip plus RCV Package – other administrative services included San Francisco Contract - \$12.6 M – Precinct equipment plus RCV Package – other administrative services included Pierce County Contract - Negotiating - expect approx. \$750,000 – RCV Package only