Date: September 18, 2023
From: Commissioner Jerdonek
To: Elections Commission

Subject: A Multi-language Open Source Ranked Choice Voting Results Reporter

The purpose of this memo is to let the Commission and the public know about an open source RCV Results Reporter[1] I created after the Commission's last meeting on July 19, 2023. The Department can use this software to improve how it reports ranked choice voting (RCV) results, either by using the project as an example or by using it as is, perhaps with modifications.

This document includes background information about the software, as well as screenshots of the reports it generates, using past contests as examples.

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1. Overview

The RCV Results Reporter enables the round-by-round results of RCV contests to be displayed in multiple languages and in an HTML format that is accessible to people with vision impairment or low vision. This adds to Dominion's default, English-only formats of PDF, Excel, and XML. A demo web page showing HTML examples in multiple languages for all RCV contests over the past four elections can be viewed here (for November 5, 2019, November 3, 2020, February 15, 2022, and November 8, 2022):
https://cjerdonek.github.io/rcv-results-reporter/

I have already let Director Arntz know about the project. On August 8, I sent him a link to the code along with detailed information about what it can do and how it works. I also offered to help by answering questions or adding new capabilities. Since June 14, I have been asking Director Arntz if I could meet with him to share information and discuss possible approaches to improving the Department's RCV results reporting.

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[1] RCV Results Reporter project and source code: https://github.com/cjerdonek/rcv-results-reporter

The Reporter is designed to work with the RCV reports generated by the Department's Dominion voting system in the same way that the Department's current, home-grown results page works with the reports the Dominion system generates for *non*-RCV contests. Specifically, the reporter can read in both the XML and Excel (".xlsx") RCV reports from Dominion's system (though XML is preferred since it's more structured and is an open data format).

Whereas the Dominion system is limited to creating PDF's, which aren't accessible, and only in English, the open source reporter can generate round-by-round reports in screen-reader friendly HTML and in multiple languages, as shown in the screenshot below:

Change language: English | Español (Spanish) | Pilipino (Filipino) | 中文 (Chinese)

(Note: the purpose of the alternate language pages is to show that the code supports multiple languages. At the moment, the RCV tables are only partially translated because certain phrases like "Continuing Ballots Total" still need to be translated.)

Ranked Choice Voting Round-by-Round Results

DISTRICT ATTORNEY CONTEST

November 8, 2022 Consolidated General Election

	Round 1			Round 2			Round 3		
	Votes	%	Transfer	Votes	%	Transfer	Votes	%	N/A
BROOKE JENKINS	126,505	45.85%	3,710	130,215	47.64%	12,197	142,412	53.68%	
JOHN HAMASAKI	102,612	37.19%	3,158	105,770	38.70%	17,136	122,906	46.32%	
JOE ALIOTO VERONESE	34,603	12.54%	2,729	37,332	13.66%	-37,332			
MAURICE CHENIER	12,211	4.43%	-12,211						
Continuing Ballots Total	275,931	100%		273,317	100%		265,318	100%	
Blanks (Undervotes)	31,130		0	31,130		0	31,130		
Exhausted	0		2,524	2,524		7,805	10,329		
Overvotes	1,279		90	1,369		194	1,563		
Non Transferable Total	32,409			35,023			43,022		
REMARKS	*Tie resolved in accordance with election law.								

Figure 1. A screenshot from the RCV Results Reporter's demo page of the HTML round-by-round report it produces for San Francisco's November 2022 District Attorney contest.

The project can also generate 3-column HTML *summary* tables suitable for inclusion in the Department's current results summary page, as shown below. These summary tables show only the first and last rounds. This is a summary format recommended by the Center for Civic Design in one of its May 2023 best practices documents.[2]

	Round 1	Round 3 (Final Round)
BROOKE JENKINS	(45.85%) 126,505	(53.68%) 142,412
JOHN HAMASAKI	(37.19%) 102,612	(46.32%) 122,906
JOE ALIOTO VERONESE	(12.54%) 34,603	*eliminated in Round 2*
MAURICE CHENIER	(4.43%) 12,211	*eliminated in Round 1*
Continuing Ballots Total	275,931	265,318
Blanks (Undervotes)	31,130	31,130
Exhausted	0	10,329
Overvotes	1,279	1,563
Non Transferable Total	32,409	43,022

Figure 2. A screenshot from the RCV Results Reporter's demo page of the HTML summary table it produces for San Francisco's November 2022 District Attorney contest.

Because the RCV Results Reporter's software is open source, it can be used as a starting point for further development or customization by the Department, or it can be used more simply as an example of what is technically possible using the Dominion system's current output files.

2. How Things Are Today

Below is a summary of some of the limitations of the Department's current RCV results reporting:

1. **The Department's summary page shows only the RCV first-choice totals** (see below for a screenshot). This has led to confusion and misunderstandings about who the winners of RCV contests have been and how they won. For example, it has led to media outlets reporting only the winner's first-choice percent, which can be much less than 50%.

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[2] Center for Civic Design's RCV page: https://civicdesign.org/topics/rcv/

DISTRICT ATTORNEY (Ranked-Choice Voting Contest)

A candidate must receive 50%+1 votes to be elected. The table below shows only first-choice votes. The candidate shaded in green on the RCV Results Report for District Attorney has the most votes based on the total number of ballots counted. Learn how RCV works.

	Ballots Counted	Percentage
BROOKE JENKINS	125,576	46.01%
JOHN HAMASAKI	101,924	37.34%
JOE ALIOTO VERONESE	33,633	12.32%
MAURICE CHENIER	11,820	4.33%
Write-in	0	0%
Total	272,953	100%
Under Votes	34,326	
Over Votes	1,061	

Figure 3. A screenshot of the RCV results on the Department's summary page for the November 2022 District Attorney contest. Only first-choice totals are shown.

2. **Members of the public need to click to a separate page for each RCV contest** to stay updated on who the winners are. This can be inconvenient, especially when there are many RCV contests.

3. **Dominion's round-by-round PDF reports are often broken across multiple pages**, making them harder to read. See the following page for a couple screenshots of this behavior.

4. **The round-by-round results have always only been in English**, so non-English speakers have never been able to see who won in their own language. This can make confusion about RCV even higher for non-English speakers, who already face challenges.

5. **Dominion's PDF reports aren't accessible to people with vision impairment.** In Alameda County, this led to a legal Settlement Agreement between the National Federation of the Blind (NFB) and Alameda County (see Section 3 below for more about this). Curiously, the Dominion voting system San Francisco had before 2019 *was* able to generate reports in HTML, but this capability didn't carry over to later versions of Dominion's system (see Section 4 below for more info and screenshots on this).
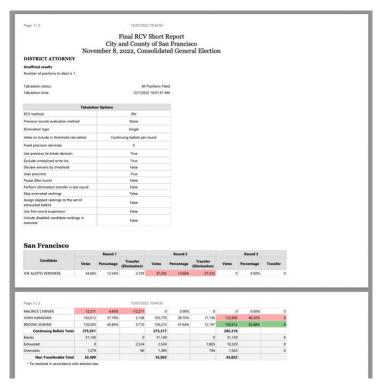
Figure 4. First example of an RCV table being broken across multiple pages in a Dominion PDF.
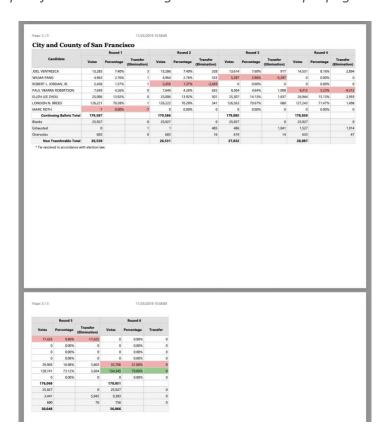

Figure 5. Second example of an RCV table being broken across multiple pages in a Dominion PDF.

3. Alameda County Settlement Agreement with National Federation of the Blind

On October 31, 2018, Alameda County signed a legal Settlement Agreement[3] with the National Federation of the Blind (NFB) that, among other things, required Alameda County to make the information in its election results summary PDF's available in accessible formats. This was in part because Alameda County's RCV results PDF's (which are the same as San Francisco's) aren't accessible to people with vision impairments. From page 12 of the Settlement:

V. WEBSITE ACCESSIBILITY

The County shall ensure that all blind persons have an opportunity that is equal to the opportunity the County affords to all other persons to access and navigate the Website.

1. By September 1, 2019, the County shall ensure that, with the exception of PDFs created or posted to the Website before 2018 and not altered in or after 2018, the entire Website, including Sample Ballots and Voter Information Pamphlets made available through the Website, conforms to, at minimum, WCAG 2.1 AA, so that blind visitors to the Website can access all of the same information and engage in all of the same transactions available to all sighted users with a substantially equivalent ease of use. To further provide substantially equivalent ease of use, the County shall ensure that all of its forms, applications, services, or transactions are Accessible Forms.

2. By January 1, 2020, the County shall ensure that all Results Summary Report PDFs on the Website are available in formats that comply with [Web Content Accessibility Guidelines (WCAG)] 2.1 AA.

4. HTML Reports in San Francisco Before 2019

Interestingly, the Dominion voting system that San Francisco had before 2019 *was* able to generate RCV round-by-round reports in HTML. Indeed, the Department posted these HTML reports on its website. However, this ability wasn't carried over to the newer version of the Dominion voting system that San Francisco acquired in 2019. Below is a screenshot of one of these HTML reports from before 2019:

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[3] Oct. 31, 2018 Settlement Agreement between the National Federation of the Blind (NFB) and Alameda County: https://nfb.org/images/nfb/documents/pdf/legal_program/settlements/alameda_county_settlement_agreement_with_exhibits.pdf

Ranked Choice Voting Results Table

Contest: **Board of Supervisors, District 2**
Load Type: **Complete**

	Round 1			Round 2			Round 3			Round 4		
	Votes	%	Transfer	Votes	%	Transfer	Votes	%	Transfer	Votes	%	Transfer
NICK JOSEFOWITZ	13644	38.64%	0	13644	38.64%	+698	14342	41.83%	+1719	16061	48.09%	0
JOHN DENNIS	3108	8.80%	0	3108	8.80%	-3108	0	0.00%	0	0	0.00%	0
SCHUYLER HUDAK	4145	11.74%	0	4145	11.74%	+793	4938	14.40%	-4938	0	0.00%	0
CATHERINE STEFANI	14415	40.82%	0	14415	40.82%	+594	15009	43.77%	+2331	17340	51.91%	0
WRITE-IN	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0
Exhausted by Over Votes	79		0	79		+5	84		+13	97		0
Under Votes	4515		0	4515		0	4515		0	4515		0
Exhausted Ballots	0		0	0		+1018	1018		+875	1893		0
Continuing Ballots	35312	100.00%		35312	100.00%		34289	100.00%		33401	100.00%	
TOTAL	39906		0	39906		0	39906		0	39906		0
REMARKS	*Tie resolved in accordance with election law.											

Figure 6. An example of an HTML round-by-round report from San Francisco's November 6, 2018 election.

The open source RCV Results Reporter I made generates round-by-round HTML reports that are substantially like the pre-2019 tables, but with an improved color scheme and in multiple languages, which the pre-2019 reports weren't available in. See Figure 1 on page 2 of this memo for a screenshot of the improved table.

5. FAQ

This section contains answers to two questions that have come up in past meetings:

1. Don't results reporters have to be certified by the California Secretary of State?
2. Can generating HTML reports risk misconfiguring the Dominion system, like Alameda County did last November when they tried to improve their RCV results reporting?

Question 1: Don't results reporters have to be certified by the California Secretary of State?

The short answer is no. Below are three examples to support this.

For example, Scytl[4] is an election technology company with an Election Night Reporting (ENR) solution that counties across the country can use to report their election results on the web.[5] Nine counties in California use Scytl's ENR solution (the earliest ones since 2008), and eight of these counties use Dominion for their voting system like San Francisco. These include Santa Clara, Contra Costa, Ventura, Marin, and others. A Sales Director at Scytl confirmed for me via email that the California Secretary of State doesn't need to approve results page solutions.

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[4] Scytl: https://scytl.com/
[5] Scytl's Election Night Reporting product page: https://scytl.com/governments-solutions/election-night-reporting/

Second, San Francisco's own results page, which was written in the PHP computer language, was developed in-house. This is also how the Department can make customizations and improvements to its results page before each election. Moreover, to my knowledge, San Francisco's home-grown results page has never been approved by the Secretary of State.

Third, Alameda County is another county in California that developed a home-grown results reporting solution. Alameda County uses the same Dominion system that San Francisco uses. Before the November 2022 election, Alameda County developed their own way to report RCV results in HTML, again without Secretary of State approval.

Question 2: Can generating HTML reports risk misconfiguring the Dominion system, like Alameda County did last November when they tried to improve their results reporting?

Alameda County's November 2022 snafu was caused by a misconfiguration of the Dominion system. However, <u>reporting the results in HTML wouldn't require any changes to how San Francisco configures its use of the Dominion system</u>. The RCV Results Reporter can generate its HTML reports from the Dominion result files that are already being generated. In fact, this is how I was able to generate the HTML tables for the past four elections on the demo page. I used the reports that were already available on the Department's website.

6. How the Results Reporter Works

The RCV Results Reporter works as follows.

First, the code reads in an XML or Excel report for an RCV contest from the Dominion system and extracts the candidate names and vote subtotals for each round. Optionally, this intermediate data can be saved to a JSON file before proceeding to the next step.

Second, the code takes the candidate names and vote subtotals from the previous step and generates one or more HTML snippets for the contest (e.g. one for each HTML template and configured language). These snippets are then saved to individual HTML files. These HTML file snippets can then later be included into a larger HTML summary page, like they are in the sample demo page.

To generate the HTML snippets, the code uses two HTML templates (one for the summary table and one for the round-by-round report), along with a configuration file of translations of phrases used in Dominion's English-only reports (things like "Overvotes," "Exhausted," and "Continuing Ballots"). These HTML templates can be customized as needed to control exactly how the HTML should look and feel, and the translations file can be expanded to support more languages and include more words.

The Results Reporter takes less than a second or so to carry out the above steps on all the RCV contests in an election. Also, the reporter works off-line and doesn't need to be connected to the internet to function.

7. Other Advantages

In addition to generating results that are in multiple languages and accessible to people with vision impairment or low vision, the project also has the following advantages:

- The HTML generated by the reporter can be customized in other ways to increase accessibility, readability, and convenience. For example, things like additional highlighting or styling, sorting of rows, and links to additional explanatory material can all be added (e.g. by linking in-line to definitions or explanations of terms like "continuing ballots" and "exhausted ballots").
- Using HTML snippets lets the results of multiple RCV contests be viewed on a single page. This way members of the public don't need to click to a different page for each contest to see who the winners are and what the final-round vote totals are.