

Remarks on Election Integrity

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Outline

- 4 Goals
- 4 Challenges
- 4 Principles
- 4 Myths
- 4 Tools
- Example: hypothetical NH post-election audit

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- **4 Goals**
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Goal 1/4

Improve Security.

Goal 2/4

Outcomes that are correct.

Goal 3/4

Outcomes perceived correct.

Goal 4/4

Outcomes verifiably correct.

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Challenge 1/4

Secret Ballots.

Challenge 2/4

Diverse voters and elections.

Challenge 3/4

Adversaries!

Challenge 4/4

No free lunches!

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Principle 1/4

Election integrity is nonpartisan.

Principle 2/4

It takes a thief...

Principle 3/4

Adversaries attack weakest link.

Principle 4/4

Detect and Recover.

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Myth 1/4

Federal certification ensures
security.

Myth 2/4

Logic and accuracy testing
ensures security.

Myth 3/4

“Not connected to internet”
ensures security.

Myth 4/4

Decentralization ensures
security.

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Tool 1/4

Public verification of
(almost) everything.

Tool 2/4

**Voter verification of
their own paper ballots.**

Tool 3/4

Compliance audit.

Tool 4/4

Risk-limiting post-election audit.

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Example: 2016 NH Governor

- Reported outcome:
 - 354,040 Sununu
 - 337,589 Van Osten
 - 33,234 other
- Margin of victory: 2.4%
- *Comparison risk-limiting audit* compares randomly chosen paper ballots with their cast vote records until “risk limit” (e.g. five percent) is met.

Audit

Sample size
Errors found
Risk

Audit

Sample size	100
Errors found	0
Risk	33%

Audit

Sample size	100	200
Errors found	0	0
Risk	33%	10%

Audit

Sample size	100	200	300
Errors found	0	0	0
Risk	33%	10%	4%

Audit

Sample size	100	200	300
Errors found	0	0	0
Risk	33%	10%	4%

Examining only 300 randomly-chosen ballots
(out of 724,863 cast) achieves our “risk limit” of 5% !

References

- Stark, P.B., and D.A. Wagner, 2012. [Evidence-Based Elections](#). *IEEE Security & Privacy*, 10, 33–41.
- Lindeman, M. and P.B. Stark, 2012. [A Gentle Introduction to Risk-Limiting Audits](#). *IEEE Security & Privacy*, 10, 42–49.

The End

Thanks for your attention!