

# Norwegian experiences with Internet voting

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**CoE Vienna**





Ida Stenerud  
Henrik Nore

**Ida Stenerud**

**2010 -**

Product owner of Norwegian Internet voting solution

**Henrik Nore**

**2008-**

Responsible for acquisition, implementation and operation of new fully integrated election system in Norway.

# Facts on voting in Norway

- 3.600.000 in electoral roll
- 78,2% turnout in 2013 parliament election
- Election period 4 years
- Complex ballot (A preferential list system where voters can choose one or more candidates across multiple lists.)
- 25 days advance voting period (Internet and paper)
- Voters can cast multiple electronic votes (advance voting), and cancel evotes by voting on paper (both in advance and on election day)

# Norwegian Internet voting timeline

2005: Feasibility study

2007: Parliament approval

2008: Project starts

2010: Internet voting tested in 10 referenda

## **2011: Local and regional election**

Internet pilot in 10 municipalities

168.000 eligible voters (4,5% of population)

## **2013: Parliament election**

Internet pilot in 12 municipalities

250.000 eligible voters (7%)

## **2015: ???**



VALG

# Reasons for piloting electronic voting

- Improved accessibility
  - ex-pats
  - disabled
- Efficiency and correctness of counting
- Cost reduction (long term)
- ~~Turnout~~

# Voting methods used in Norway

Medium	Use in an Controlled Environment	Use in an Uncontrolled Environment	Use in Mixed Environments
Voting with paper ballots	Voting with paper ballots in polling stations ✓	Postal voting ✓	Mobile ballot box voting ✓
Voting with NVT	<b>Direct recording electronic (DRE) voting systems</b>	<b>Internet voting</b> ✓	<b>Hybrid NVT:</b> DRE systems using Internet voting technology ✓ <b>In 2015?</b>
Paper ballots and electronic counting	<b>Ballot scanner</b> ✓		Centrally counted postal votes using <b>ballot scanners</b> ✓

Table 1: Forms of Voting in the OSCE Area

# Premises for the Norwegian solution

- Voting from standard computers – no extra equipment needed
- Use of existing authentication infrastructure (IDporten)
- A government owned and operated system
- Full transparency of process and solution

# A quick overview of the Internet voting solution



- Log on  
- Submit  
vote

E-voting system



Return code

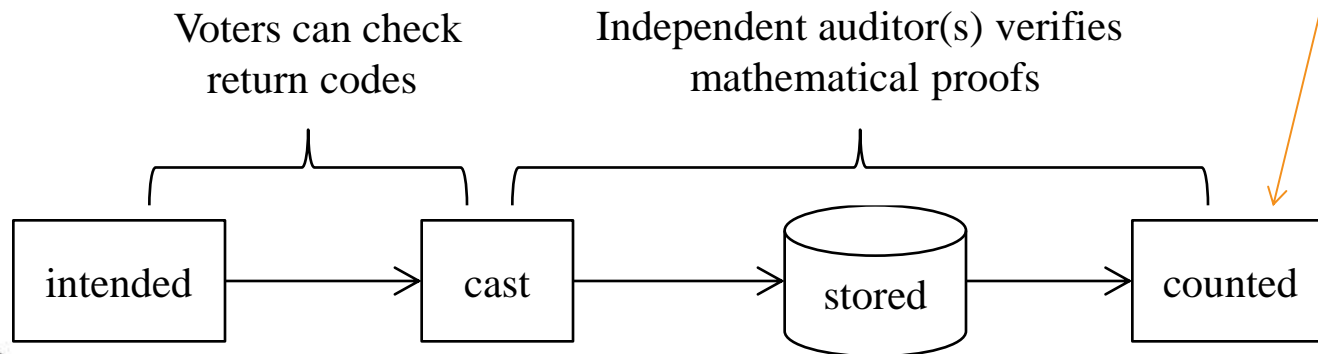


Polling card



# 2011 verifiability model

Verifiable  
mixnet

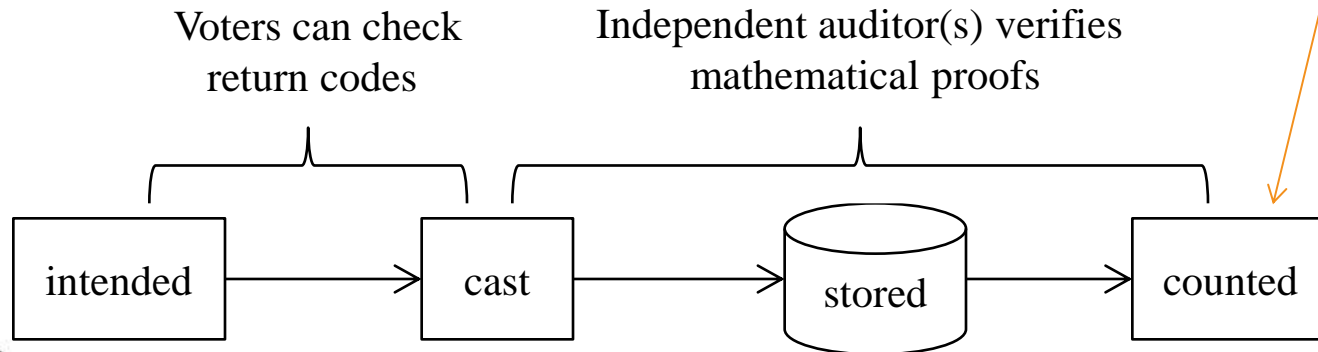


Election result

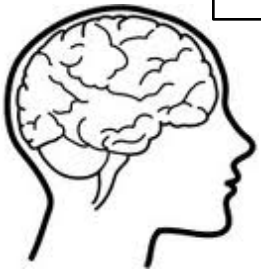
Voter

# 2013 verifiability model

Fully  
Verifiable  
mixnet



Election result



Voter

Voters can check  
Stored-as-cast proof

# Why verifiability?

- Return codes makes attacks on voter pc's detectable
  - and voters appreciate feedback that the vote was successfully cast
- Verifiability builds trust among stakeholders
  - Academia will never trust a non-verifiable electronic voting system!
- Mathematical proofs of correct counting gives the EMB confidence that every cast vote is counted correctly



VALG

# 2011 Internet voting project success factors

- Procurement process – competitive dialogue
- Learning by observing and improving other solutions
- All stakeholders – including the opposition – were involved
- 10 pilot elections before “the real” pilot

# 2013 Internet voting project

- Improved verifiability model
- Internet Election Committee (IEC) was introduced
- Improved routines for poll card printing and key management
- Replaced Java with Javascript on e-voting client
- A programming error resulted weak encryption of 40.000 ballots (corrected during election)
  - Openness (still) builds trust

# Numbers from 2011 and 2013

2011: 28001 Internet voters

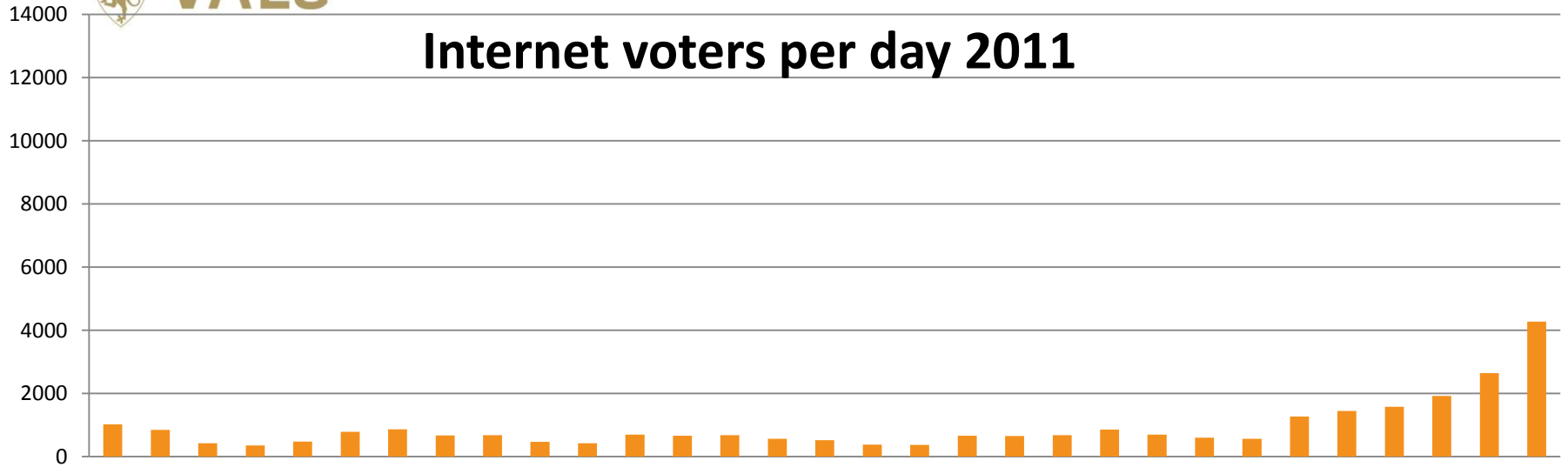
- 73% of advance votes were cast over the Internet
- 16% internet turnout of all eligible voters

2013: 70622 Internet voters

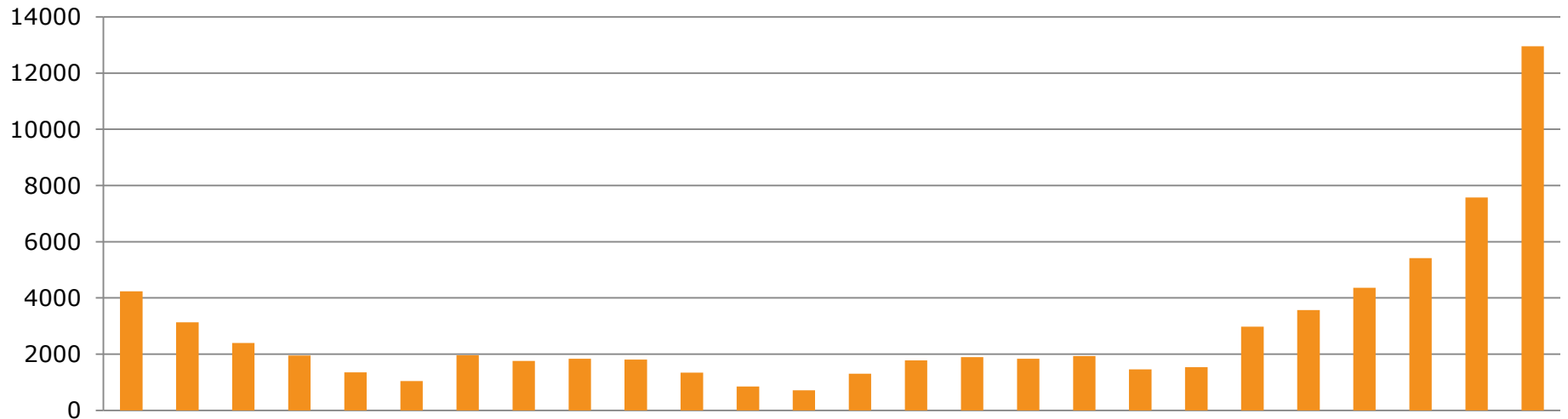
- 76% of advance votes cast over the Internet
- 28% internet turnout of all eligible voters



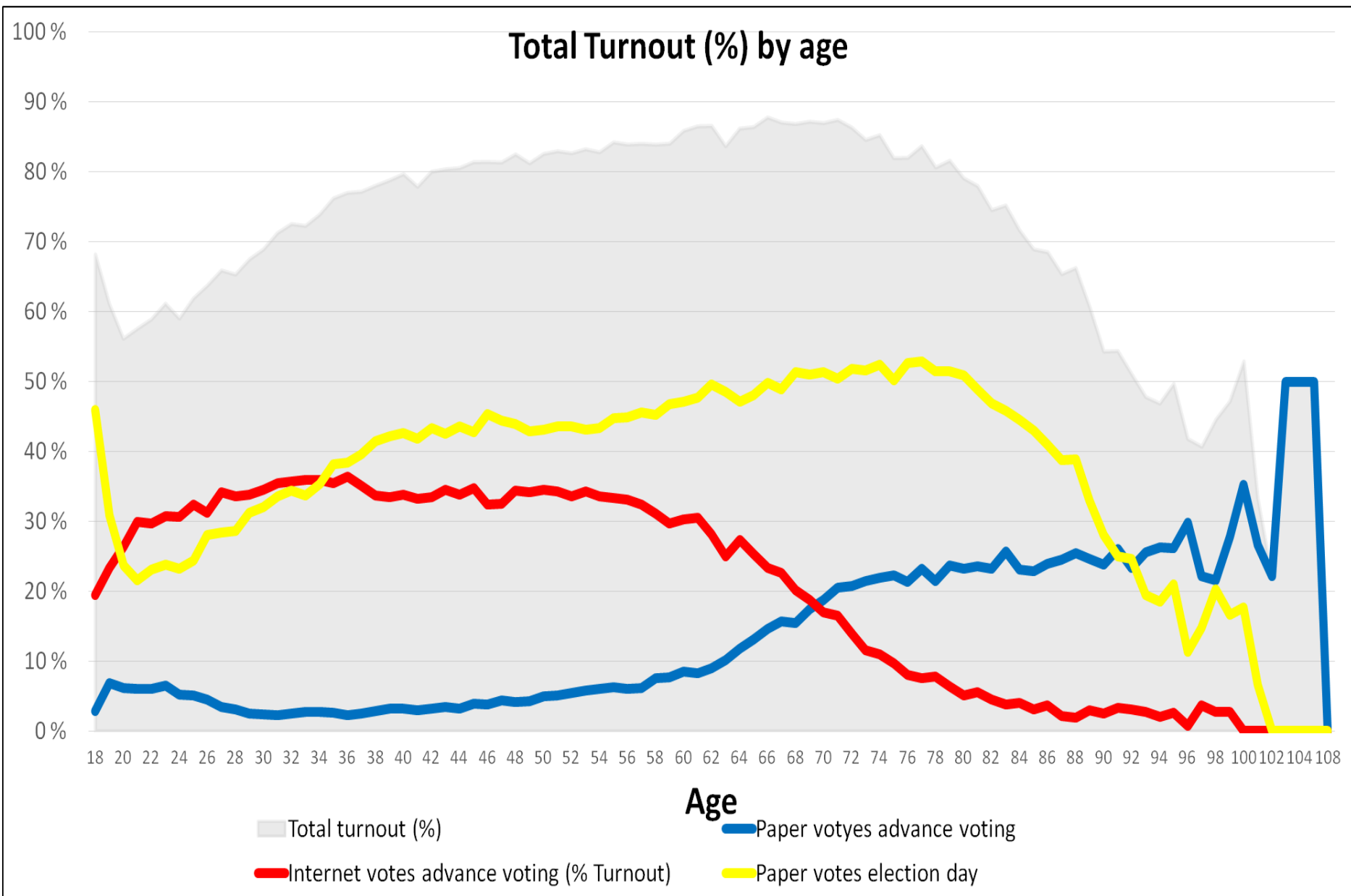
## Internet voters per day 2011



## Internet voters per day 2013



# Data from 12 internet municipalities (250.000 possible voters):





# The future of Internet voting in Norway

- According to Norwegian law, Internet voting is in compliance with secrecy of the vote
- Still, this is politically controversial
- The new government (formed 2013) have earlier voted against Internet voting in parliament
- The government has not yet decided how to proceed with Internet / electronic voting

# **System demonstration (If time)**



## The Norwegian Parliamentary Election 2013 TEST

English ▾

### Internet voting

All eligible voters in Bodø, Bremanger, Fredrikstad, Hammerfest, Larvik, Mandal, Radøy, Re, Sandnes, Tynset, Vefsn og Ålesund may vote electronically during the parliamentary election.

You may vote online until September 6th 23:59.

For your security, you will automatically be logged out after 30 minutes.

### How to vote online

Authentication is done through ID-porten (using, for example, MiniID or BankID), where your cell phone number must be registered.

The first time you authenticate, you'll be prompted to share your phone number. **In order to vote online, you must select "Share with eValg".**

Watch a [video](#) illustrating the voting process.

### Your ballot must be kept secret.

You must therefore ensure that you cast your vote unobserved.

Remember that you may vote via the Internet again at any time during the advance voting period. You may also vote with a paper ballot at a polling station. A paper vote will cancel an Internet vote.

[Log in to vote](#) >



## 2013 parliamentary election

### Your ballot must be kept secret

- You must therefore ensure that you cast your vote unobserved.

### You may vote via the Internet as many times you want

- To vote again, you must log out and in again.
- In the interest of keeping the ballot secret, you will never be able to see previously cast votes.
- Your last Internet vote will be the one that counts.

### A paper vote will cancel all Internet votes

- You may vote both via the Internet and on paper.
- You may only vote once on paper.
- On election day you may only vote at the polling station.

Parliamentary election in Hordaland


Online voting period: 1. January 2013 0:00:00 - 31. December 2013 23:59:00


[Start voting](#)


qa-evalg




 Select an electronic ID:

 **MinID**  
Use codes from SMS or PIN code letter >

 **BankID**  
Use security code generator from your bank >

 **buypass**  
Use smart card and card reader >

 **Commfides**  
Use your USB stick >

[How to obtain an electronic ID](#)

qa-evalg



Log in with MinID

MinID

Personal ID number:  (11 digits)

Password:

[Forgotten password?](#)

CANCEL

NEXT >

[Register as new user](#) | [Order PIN codes](#) | [Edit user profile](#)

[Contact form](#) | Tel: 800 30 300 | [Help to log in](#) | [Security and privacy](#)

Operated by the Agency for Public Management and e-Government (Difi)



## Select ballot for parliamentary election in Hordaland

There are 15 electoral lists in your county. These are listed in random order below.  
Choose the party you want to vote for.

- Norges Kommunistiske Parti
- Pensjonistpartiet
- Det norske Arbeiderparti
- Miljøpartiet De Grønne
- Sentrumsalliansen
- Rødt
- Demokratene
- Fremskrittspartiet
- Sosialistisk Venstreparti
- Kystpartiet
- Venstre
- Senterpartiet
- Høyre
- Kristent Samlingsparti
- Kristelig Folkeparti
  
- Blank stemmeseddel

Show ballot





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- Blank stemmeseddel

Show ballot >





## Ballot for Norges Kommunistiske Parti in the parliamentary election in Hordaland

You may change the sequence of the candidate list by entering new numbering in the boxes to the left of each candidate. You may also delete candidates by clicking in the field to the right of the candidate's name.

### Change order

- Assign a new position to the candidate by clicking the associated field in front of the candidate's name and select the desired number from the list.
- You cannot assign multiple candidates to the same number.
- If you want to change the number of a candidate you have stricken, you must first uncheck the box to the right of the name.

### Delete

- You may delete a candidate by checking the box to the right of the candidate.
- You may delete as many candidates as you want.
- In order to delete a candidate whose position you have reassigned, you must first remove the new number.

No	Change	Name	Birth year	Delete
1.	<input type="text"/>	Benedikte Joakimsen	f. 1918	<input type="checkbox"/>
2.	<input type="text"/>	Idunn Kolbjørnsen	f. 1944	<input type="checkbox"/>
3.	<input type="text"/>	Angelina Austad	f. 1928	<input type="checkbox"/>
4.	<input type="text"/>	Mildrid Torgersen	f. 1952	<input type="checkbox"/>
5.	<input type="text"/>	Cecilie Tandstad	f. 1923	<input type="checkbox"/>
6.	<input type="text"/>	Håvard Endal	f. 1920	<input type="checkbox"/>
7.	<input type="text"/>	Bente Børsheim	f. 1970	<input type="checkbox"/>
8.	<input type="text"/>	Ruth Gjøsend	f. 1930	<input type="checkbox"/>



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1.	<input type="text"/>	Benedikte Joakimsen	f. 1918	<input type="checkbox"/>																				
<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td> </tr> <tr> <td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td></td><td></td><td></td><td></td> </tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
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No	Change	Name	Birth year	Delete
1.	<input type="text" value="5"/>	Benedikte Joakimsen	f. 1918	
2.	<input type="text"/>	Idunn Kolbjørnsen	f. 1944	<input type="checkbox"/>
3.	<input type="text"/>	Angelina Austad	f. 1928	<input type="checkbox"/>
4.	<input type="text"/>	Mildrid Torgersen	f. 1952	<input type="checkbox"/>
5.	<input type="text"/>	Cecilie Tandstad	f. 1923	<input type="checkbox"/>
6.	<input type="text"/>	Håvard Endal	f. 1920	<input type="checkbox"/>
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9.	<input type="text"/>			<input type="checkbox"/>



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8.	<input type="text"/>	Ruth Gjøesund	f. 1930	<input type="checkbox"/>
9.	<input type="text"/>			<input type="checkbox"/>



## Checking your ballot

Below you will find your completed ballot. If you have made changes to the ballot, these will be displayed. The rest of the candidate list will remain unchanged. Verify your ballot before submission.

You are voting for:

### NORGES KOMMUNISTISKE PARTI

You have re-numbered the following candidates:

From	To	Name	Birth year
1	5	Benedikte Joakimsen	f. 1918

You have stricken the following candidates:

No	Name	Birth year
<del>3</del>	<del>Angelina Austad</del>	<del>f. 1928</del>
<del>5</del>	<del>Cecilie Tandstad</del>	<del>f. 1923</del>
<del>7</del>	<del>Bente Børshøim</del>	<del>f. 1970</del>
<del>9</del>	<del>Viljar Løge</del>	<del>f. 1994</del>
<del>11</del>	<del>Sana Sjøen</del>	<del>f. 1968</del>
<del>13</del>	<del>Sanna Grønli</del>	<del>f. 1982</del>
<del>15</del>	<del>Siren Steiro</del>	<del>f. 1955</del>



Your vote will now be recorded.  
Please wait...  
This normally takes between 15 and 60 seconds.







## Find your vote in the digital ballot box

### Your vote has now been submitted; this step is voluntary and not necessary in order to complete voting.

It may be advantageous to have a certain technical interest and insight to carry out this step, but in principle anyone can do it.

You can personally verify whether your vote has been saved in the digital ballot box. This will be possible until the votes are counted at the end of election day. By following the instructions on this page you can download an SHA-256 hash of your encrypted vote. It is important to understand that the hash does not reveal who you are or your vote.

A complete list of the hashes of all received votes will be published every hour on the hour at the [GitHub page](#). The list will be updated and available until the votes are counted on election day. By checking that your hash is on the list, you will know that your Internet vote is saved in the digital ballot box. On election day, an independent third party will verify that the list matches the content of the digital ballot box when the contests are counted. As long as the list and ballot box match, we know all the votes are counted.

Please note!! If you navigate away from this page, you will not be able to see the hash of your encrypted vote later. You should therefore make sure that you save your hash.

[See SHA-256 hash](#)

Clicking the link below will display a hash and two digital signatures. The hash is an abbreviation of your encrypted vote. The signatures can be used to verify that the hash is from a real vote.

See the bullet point list below for a description of how to find your hash in the list.

- Click "See SHA-256 hash" below. This will bring up a screen with one hash and two hash signatures. You should save this information in an empty text document so you can look up your hash later.
- The list will be updated each hour. At the GitHub-page for the election you can find the textfile "Bulletin\_130001.txt". When you open this textfile you can search for your hash, Ctrl+f, and paste in (Ctrl+v) your hash, to verify that your vote's hash is on the list. For a more detailed description of how to verify your vote see the "README"-file at the github-page.
- If you find the hash, you know that your vote has been received and stored.
- If you cannot find the hash, you may have been too quick and the list may not have been updated. If you believe the list has been updated after you voted, but you still cannot find your hash, call user support at 800 38 254.
- If you vote multiple times, all the hashes will be in the list. Feel free to verify multiple times.

Log out >



Hi, Erik Vik.

Your vote in the  
parliamentary election was  
received at 7/9-2013:  
12:18.

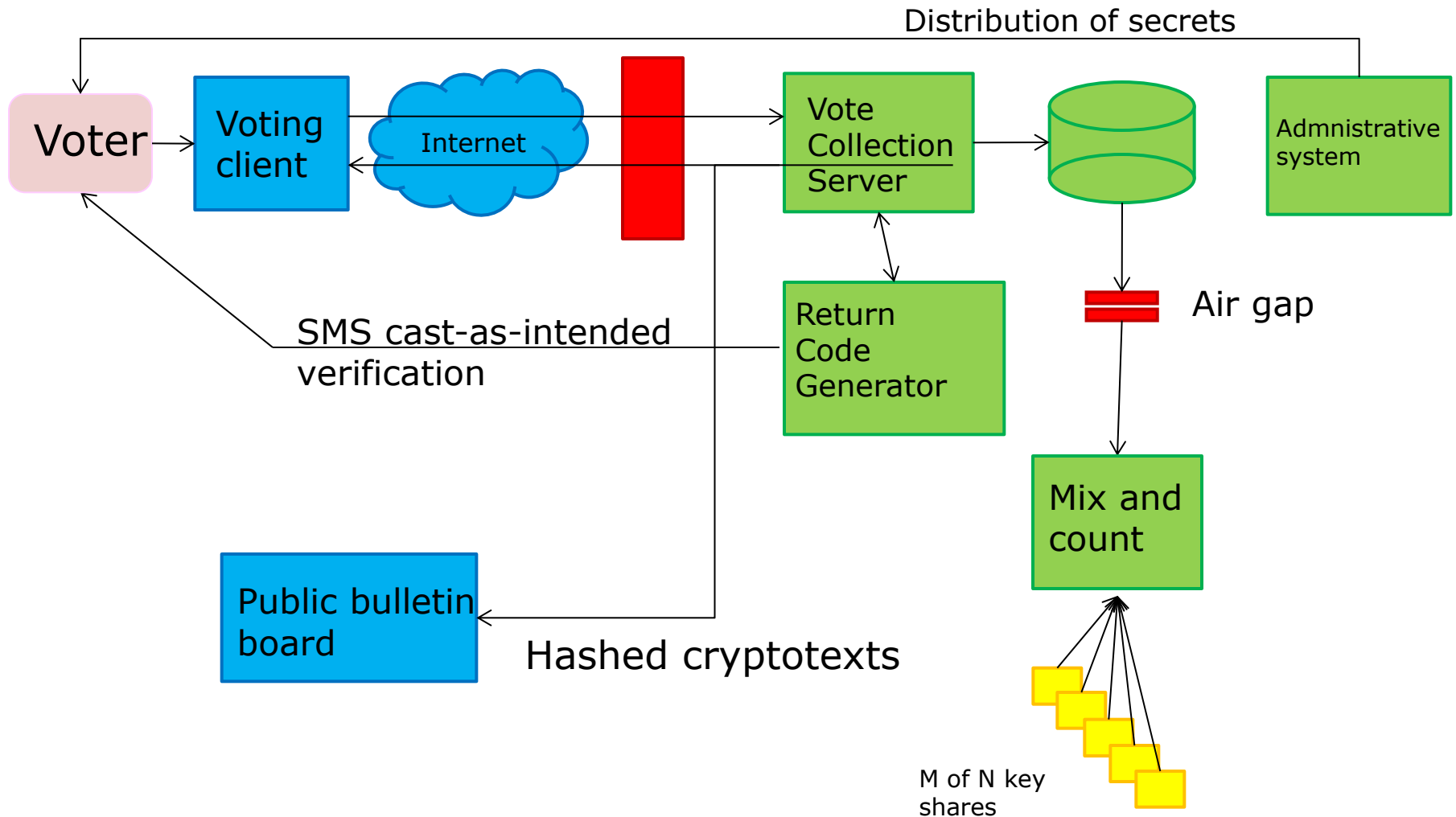
The party/ group you  
voted for has return code  
1758.

You deleted 7 candidates  
and made 1 re-  
numberings.

Please check the return  
code against your poll  
card. Call 800 38 254 if  
the return codes do not  
match.



# Revised conceptual model for 2013



**From OSCE handbook for observation of NVT Annex B:  
Master Checklist:  
Norway have considered and evaluated all questions,  
here are some:**

- Has the NVT system been certified in a transparent process by a qualified independent body, under both national legislation and international good practice?
- To what extent are voters, election administrators and observers capable of understanding and using the system? What skills are needed to make them educated users? What kind of training or voter education could build these skills?
- Do international observers have full access to the process and to documentation, including certification, testing, verification and audit reports?
- Is a voter-verifiable paper record produced in order to ensure that the voter's choice has been recorded accurately and to create the possibility for observers without technical expertise to observe a recount? If not, what measures ensure universal, end-to-end verifiability of the results?