User Interface

- Voter check-in (verify eligibility without storing identity, e.g. id generator -> mail -> voter -> polling station auth)
- Electronic ballot entry
  - First vote selection (candidate in constituency)
  - Second vote selection (party list)
- Vote confirmation screen
- Invalid ballot handling

Functional requirements

FR-1.1: Election Configuration

- System shall allow creation of election records with date, year, and threshold percentage
- System shall allow batch creation of election records
- System shall support multiple elections in the database simultaneously

FR-1.2: Constituency Management

- System shall track eligible voters per constituency
- System shall support constituency count and boundary changes between elections

FR-2.1: Vote Recording

- System shall record individual votes separately for first and second votes

FR-2.2: Vote Storage

- System shall store individual votes ONLY for the 2025 election
- System shall NOT store individual votes for the 2021 election (aggregated data only)

FR-2.3: Ballot Validation

- System shall detect and flag invalid ballots
- System shall allow recording of invalid first votes separately from invalid second votes
- System shall prevent duplicate voting

FR-3.1: Aggregated Results Calculation

- System shall aggregate first votes by candidate per constituency

- System shall aggregate second votes by party per state
- System shall calculate turnout statistics per constituency

FR-3.2: Direct Mandate Determination

- System shall identify the winner in each constituency (highest first votes)
- System shall store direct mandate results with vote counts

FR-3.3: Proportional Seat Allocation

- System shall apply 5% threshold (or 3 direct mandates exception or minority exception - SSW, or the Sorbs)
- System shall calculate seat allocation using Sainte-Laguë method
- System shall identify overhang seats when direct mandates exceed proportional entitlement
- System shall calculate leveling seats to restore proportionality
- System shall determine final Bundestag composition

FR-4.1: Historical Comparison

- System shall enable comparison of 2021 and 2025 election results

Non-Functional requirements

- Everything that can be shall be implemented in SQL
- System shall be correct and give exactly the results of the 2021 and 2025 elections

4.1 Performance

NFR-1.1: Throughput

- System shall support concurrent vote entry from 10,000+ polling stations
- System shall handle peak load of 50,000 votes per minute during election day

NFR-1.2: Scalability

- System shall support database growth to accommodate future elections (2029, 2033, etc.)
- System shall handle up to 60 million individual vote records (2025 election)

NFR-2.1: Data Protection (GDPR Compliance)

- System shall NOT store any personally identifiable voter information
- System shall ensure votes cannot be traced back to individuals

Acceptance criteria

5.1 Pre-Election Setup (Deliverable: Ready System before Election Day)

AC-1.1: Master Data Loaded

- All 16 federal states configured
- All 299 constituencies for 2025 election entered with boundaries
- All registered parties entered
- All state party lists submitted and verified
- 2021 election aggregated data imported for comparison

AC-2.1: Vote Recording

- System records first and second votes separately
- The system calculates the exact official voting results for the years 2021 and 2025