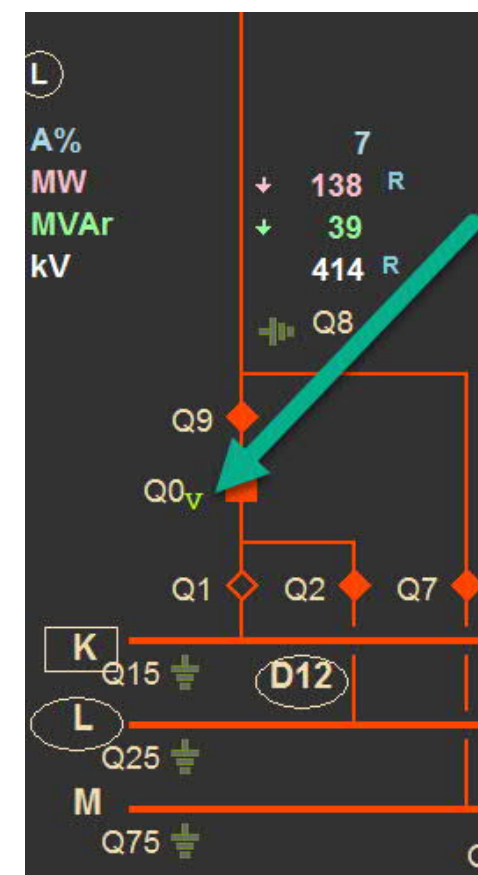
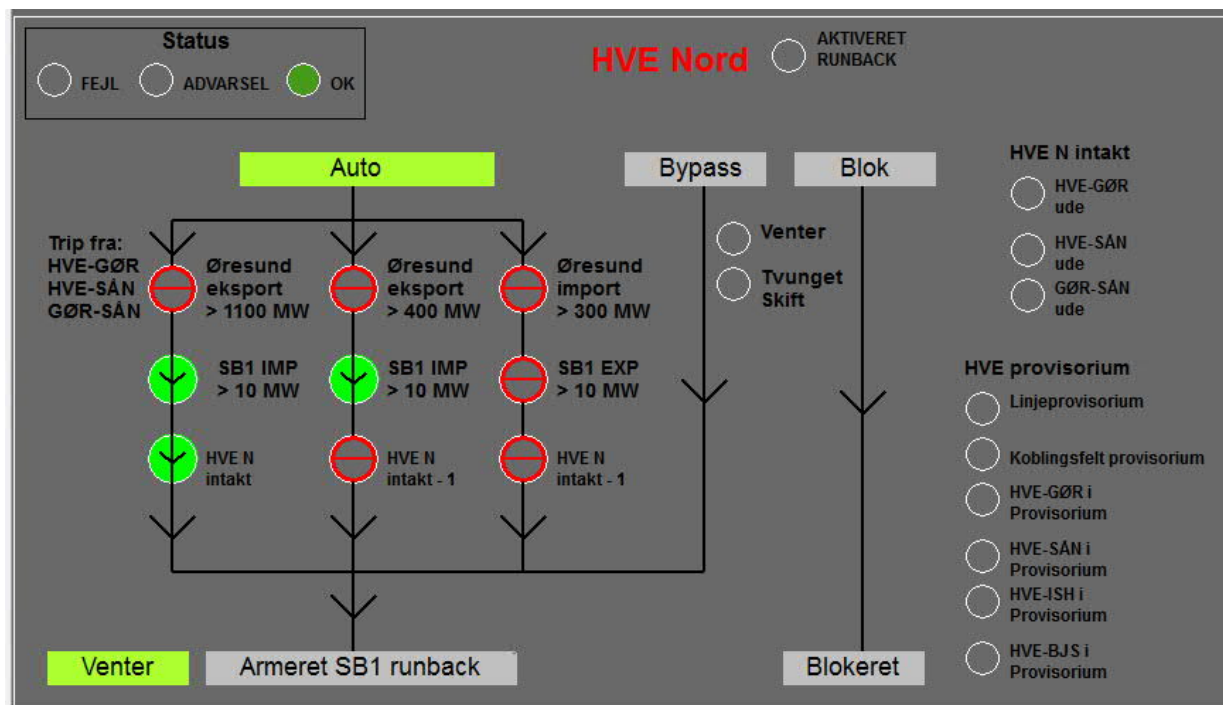
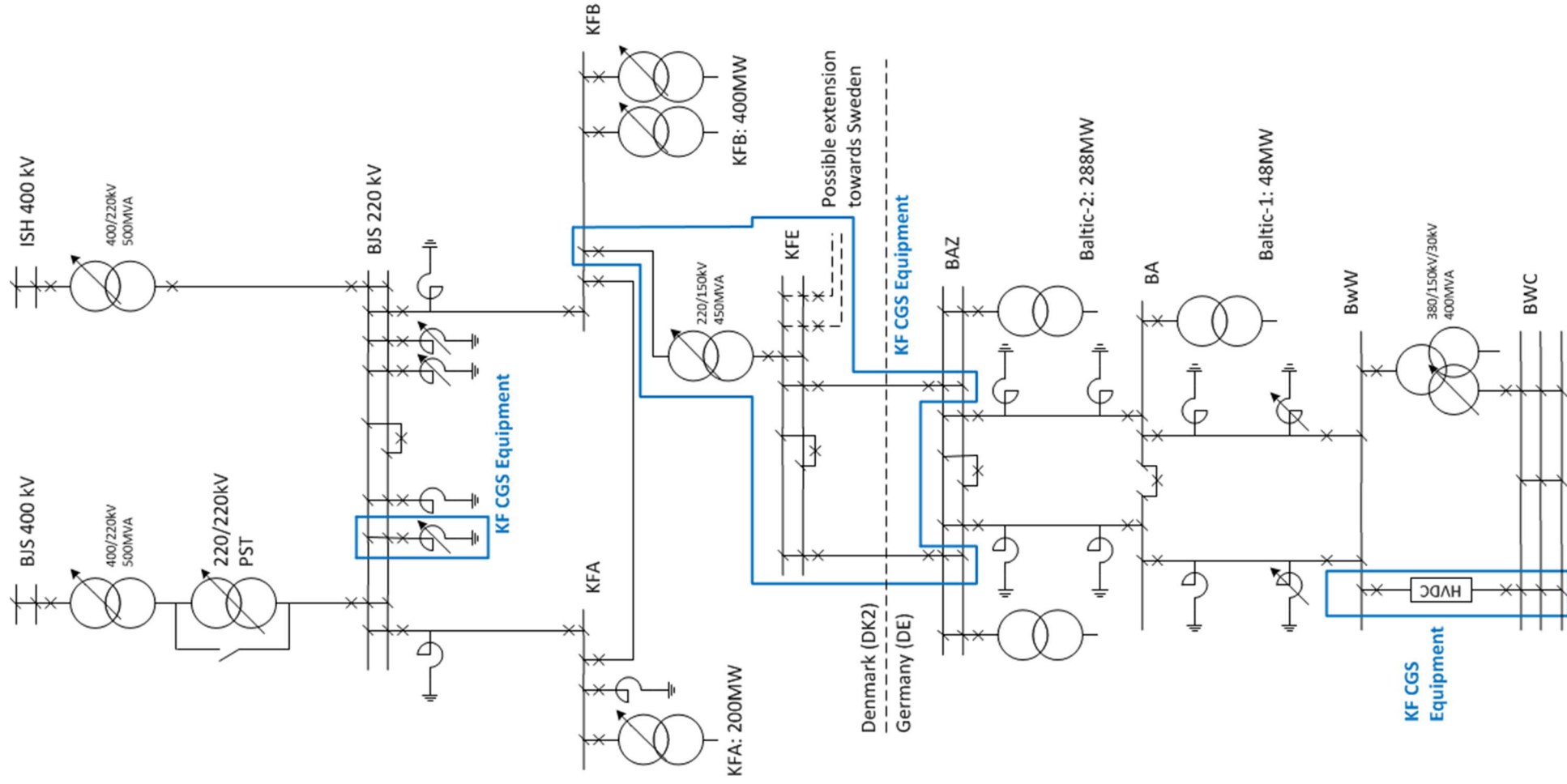


# SYSTEMVÆRN KRIEGERS FLAK

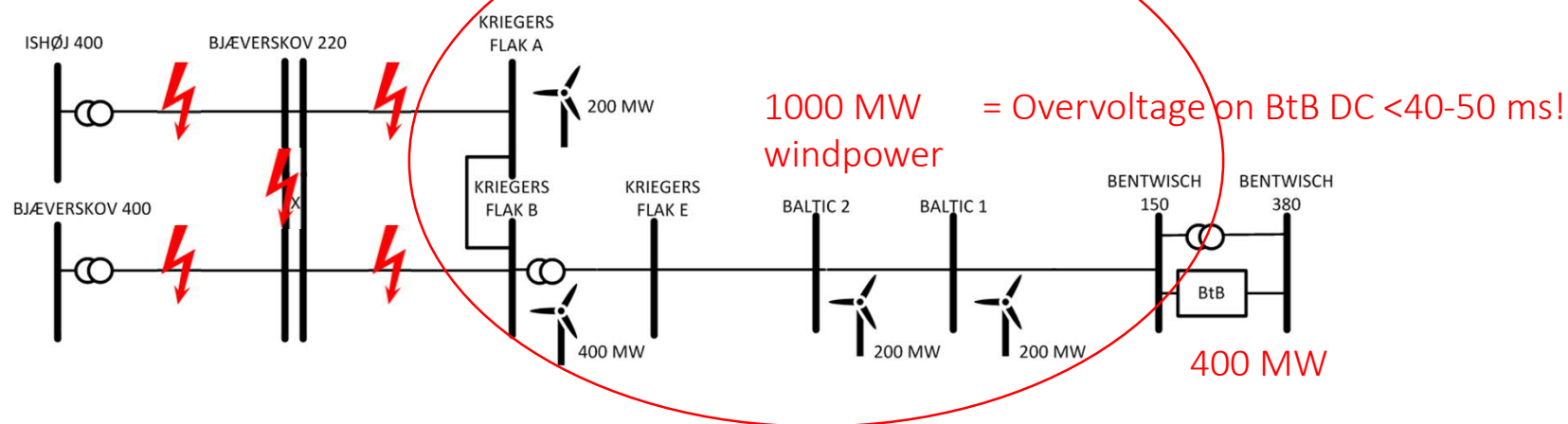
*Frank Larsen, [fls@energinet.dk](mailto:fls@energinet.dk)*





# LAST LINE TRIPPING

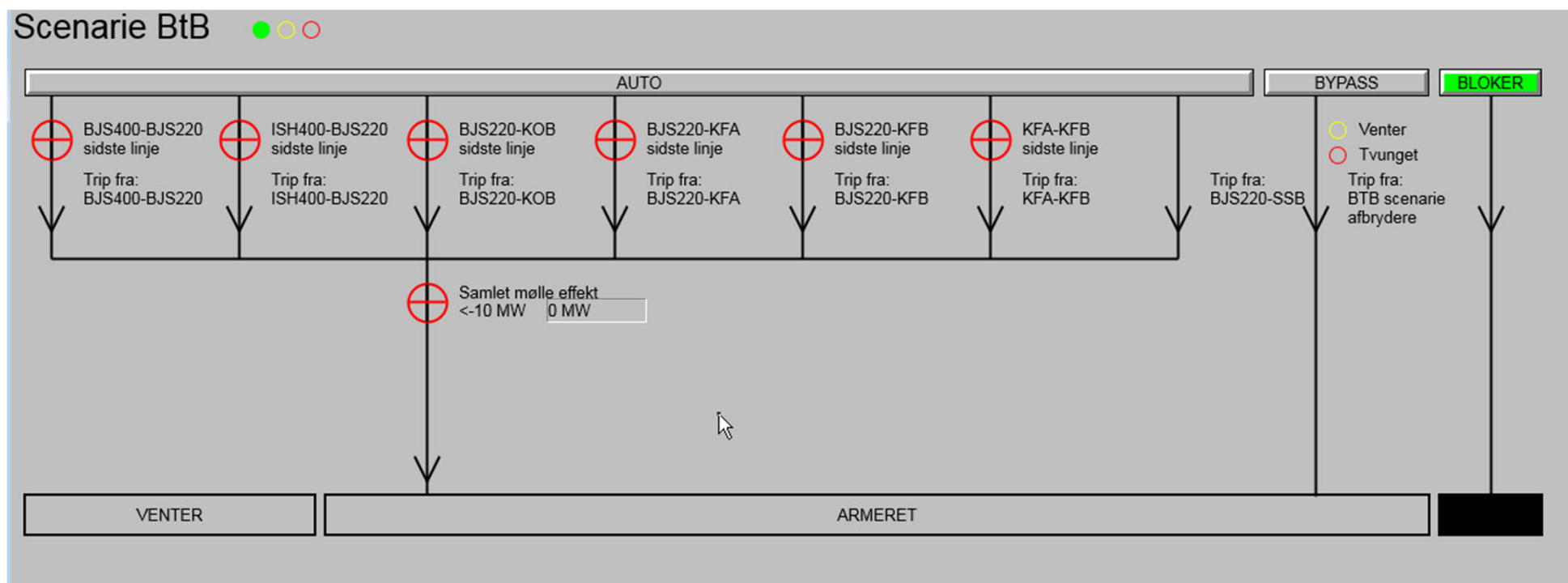
## Challenge



## Solution

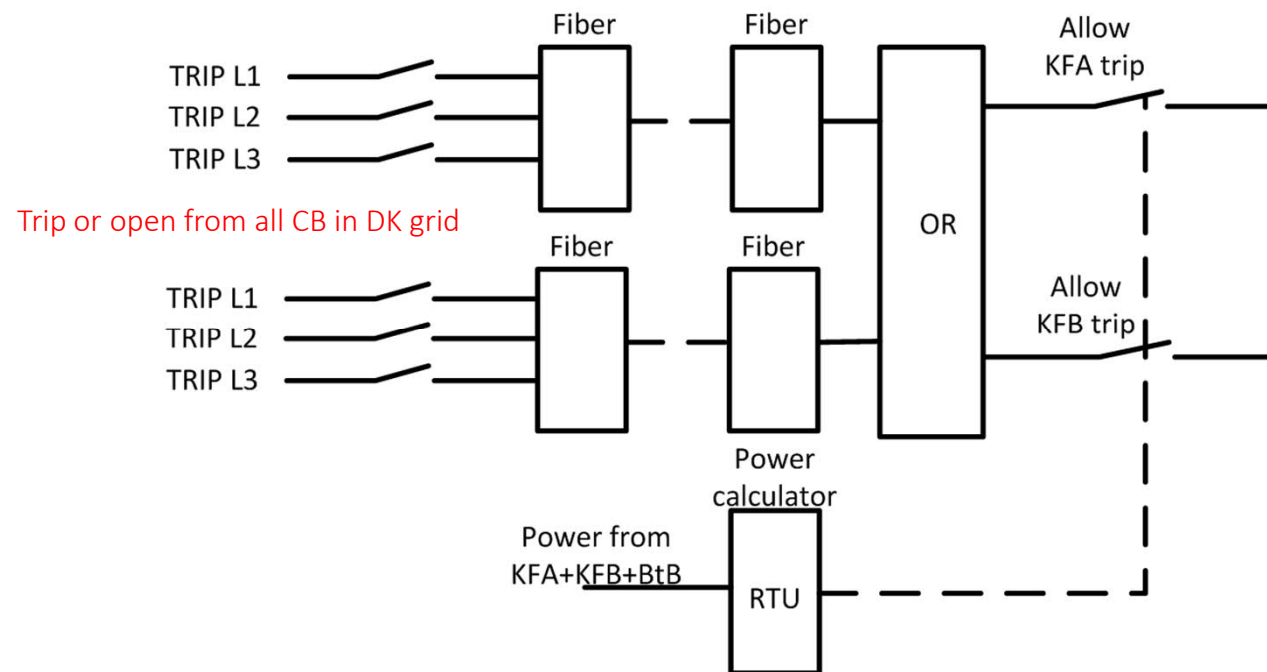
- Fast tripping solutions over fiber relay channels (app. 10 ms)
- Only tripping of KFA+KFB windfarms above 400 MW in all

# CONTROL CENTER



# LAST LINE TRIPPING

Solution



Challenge for manual operation!

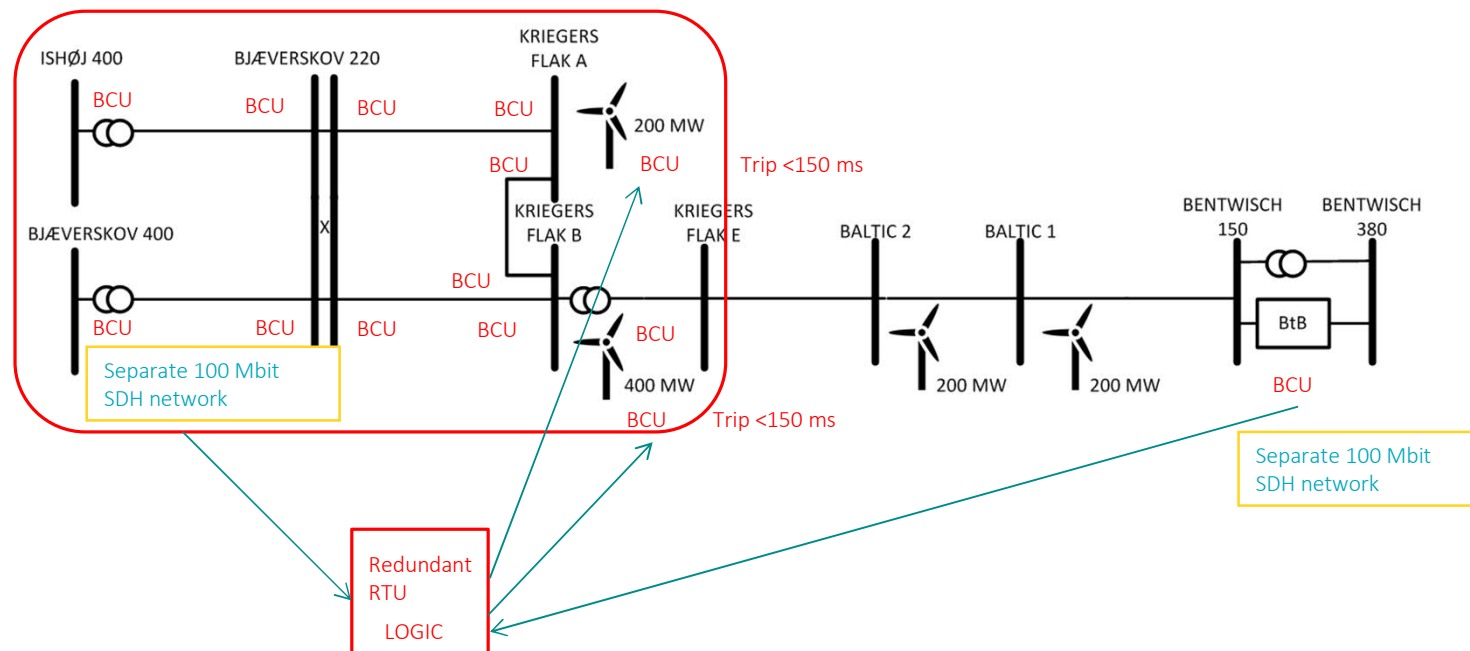
# LAST LINE TRIPPING / TRF I>

Wind turbine models helped us!

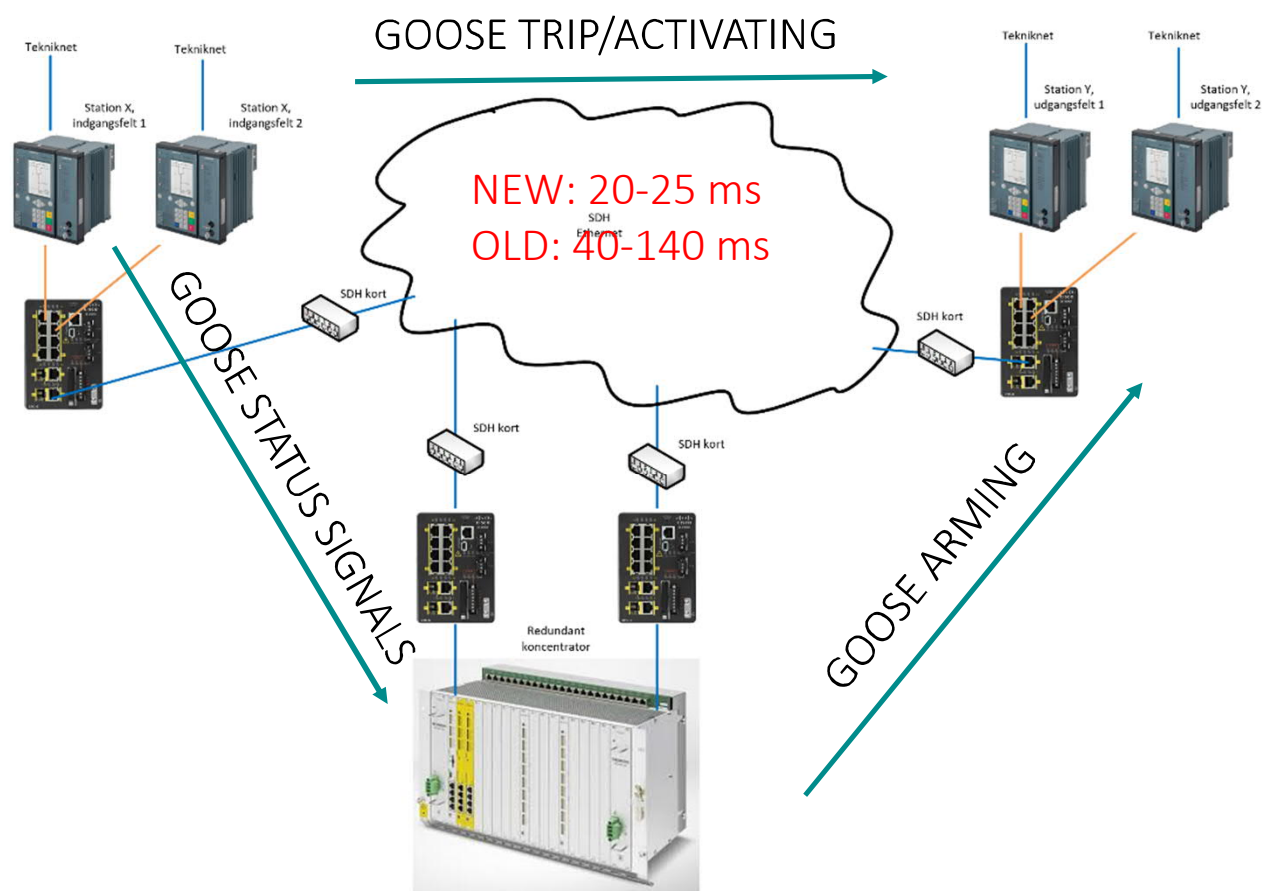
- Overvoltage in AC net
- Unstable BtB

Additional protection

- Trf I>



# BETTER HARDWARE





# TEST

- TEST IN LAB OF LOGIC
- TEST THROUG SDH NETWORK
- MULTITRIPS = LONGER RESPONSE
- LIVE TEST = 20-25 ms
- TEST OF INPUTS AND OUTPUTS

## TO CONSIDER

- LOGIC FOR LAST LINE, LINE ON EMPTY BUSBAR
- MEASUREMENTS CHANGING DIRECTION DURING FAULT
- TIMING BETWEEN TRIP AND CHANGE OF SCENARIO
- FAULTS IN SYSTEM