



Auxiliary power system for control and protection equipment in Statnett substation

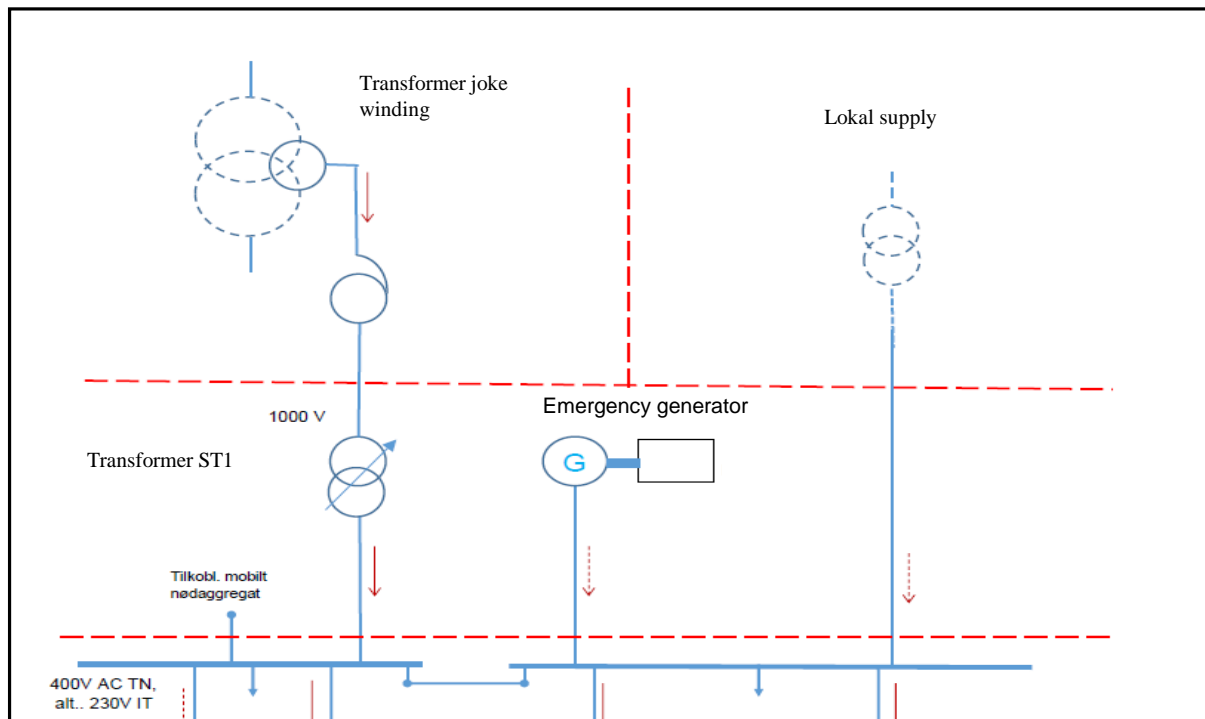
Relay Protection and Automation for Electric Power Systems 2017

St Petersburg 27.04.2017 / Rannveig Løken, Statnett

Statnett

AC Power supply

- Joke winding of the main transformer via the station transformer
- Local supply via a station transformer
- Emergency generator
- Two busbar normally connected.



AC distribution board

Supplied from

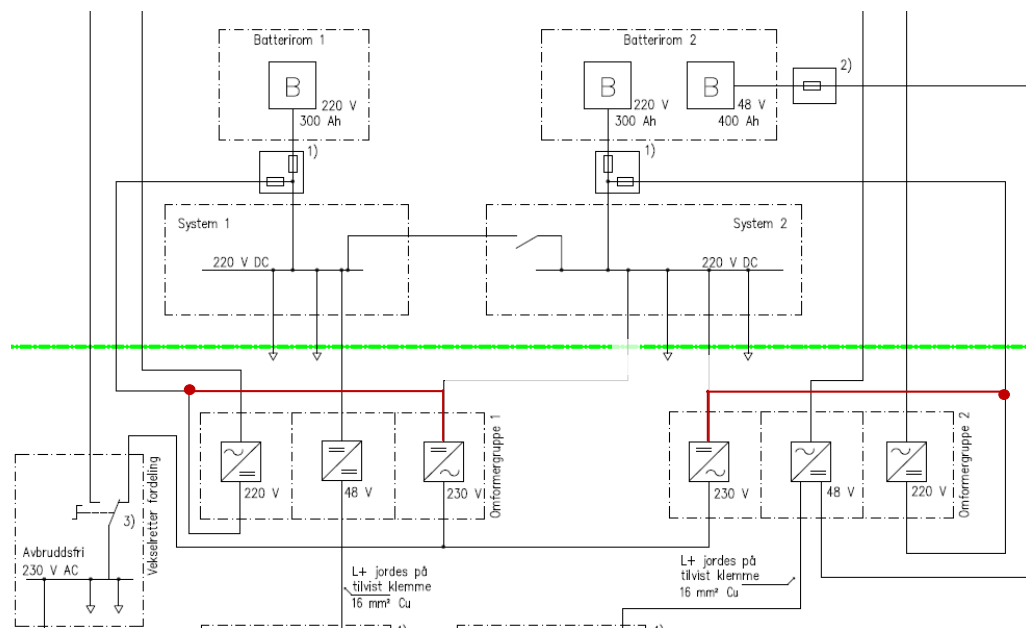
- Station transformer (ST1),
- Local transformer (LT1) or
- Emergency generator (EG1).

Separate circuit breaker panel for each power sources



Auxiliary system components in control room

- 230V AC inverter distributor
- Converter group 1/ Converter group 2:
 - 220V charging rectifier for 220V battery 1/ battery 2
 - 230 V inverter
 - 220V/48V DC/DC converter /48V charging rectifier for 48V battery 2
 - A 48V DC distribution system 1/ system 2



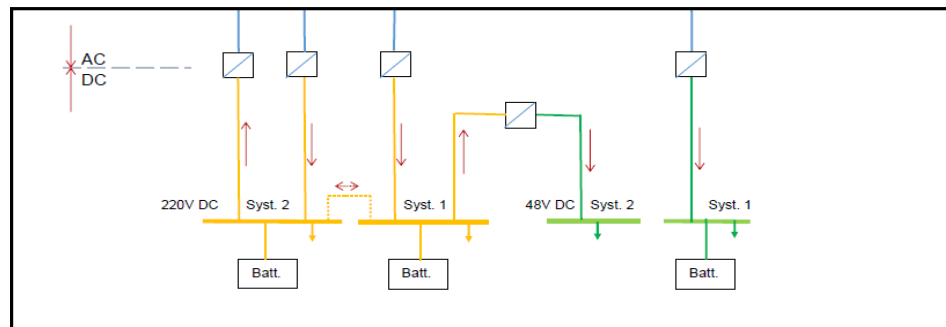
48V DC SYSTEM

Supply the ICT infrastructure

- Two 48V DC distribution boards
- DC/DC converter 220V/48V connected to 220V battery 1
- 48V battery

Cables - short-circuit proof installation

The capacity of the battery - 12 hours

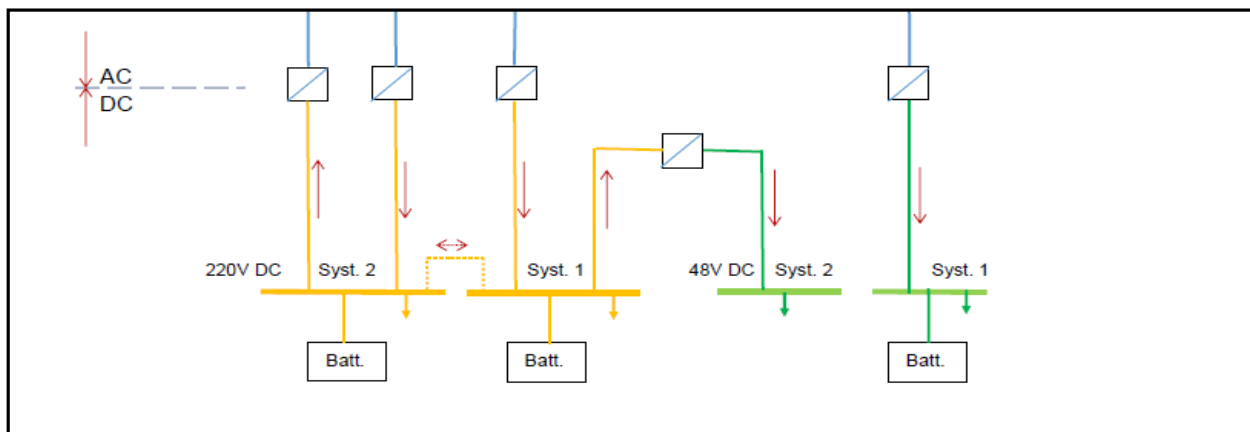


220V DC SYSTEM

- Two 220V batteries- capacity of 300Ah/10h
- Four x 1-pole battery fuse box with short-circuit proof cable installation
- Capacity -supply the substation for at least 12 hours
- Placed in separate rooms
- Cables from the batteries - short-circuit proof installation
- Two charging rectifiers (220V battery) - own cabinet
- Two battery guards (overvoltage, undervoltage and insulation monitoring)

Circuit breakers

- 2 separate trip circuits,
- Operated by two separate 220 V DC system.
- Two independent systems



DC power supply - critical

DC system

- Most critical part of the auxiliary power supply
- Failure
 - No operation of circuit breakers
 - Control and protection system not in operation



Power supply for protection

Protection functions - trip coil - battery 1:

- Distance protection 1
- Differential protection

Protection functions - trip coil - battery 2:

- Distance protection 2
- Differential protection 2, if duplicated
- Overcurrent protection
- Earth fault overcurrent protection
- Temp and pressure detectors
- Buchholz relay



Summary - Auxilliary Power system

