Auxiliary power system for control and protection equipment in Statnett substation

Relay Protection and Automation for Electric Power Systems 2017

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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