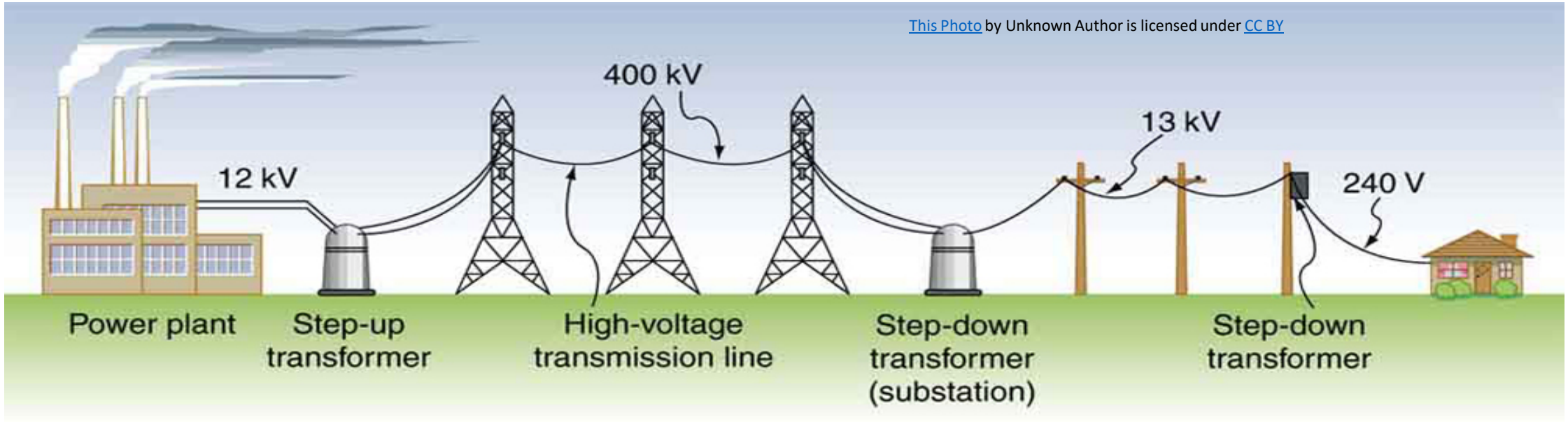
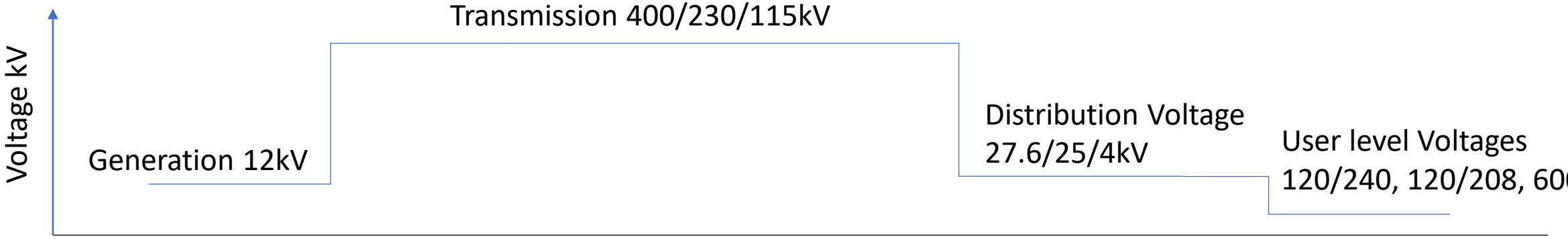
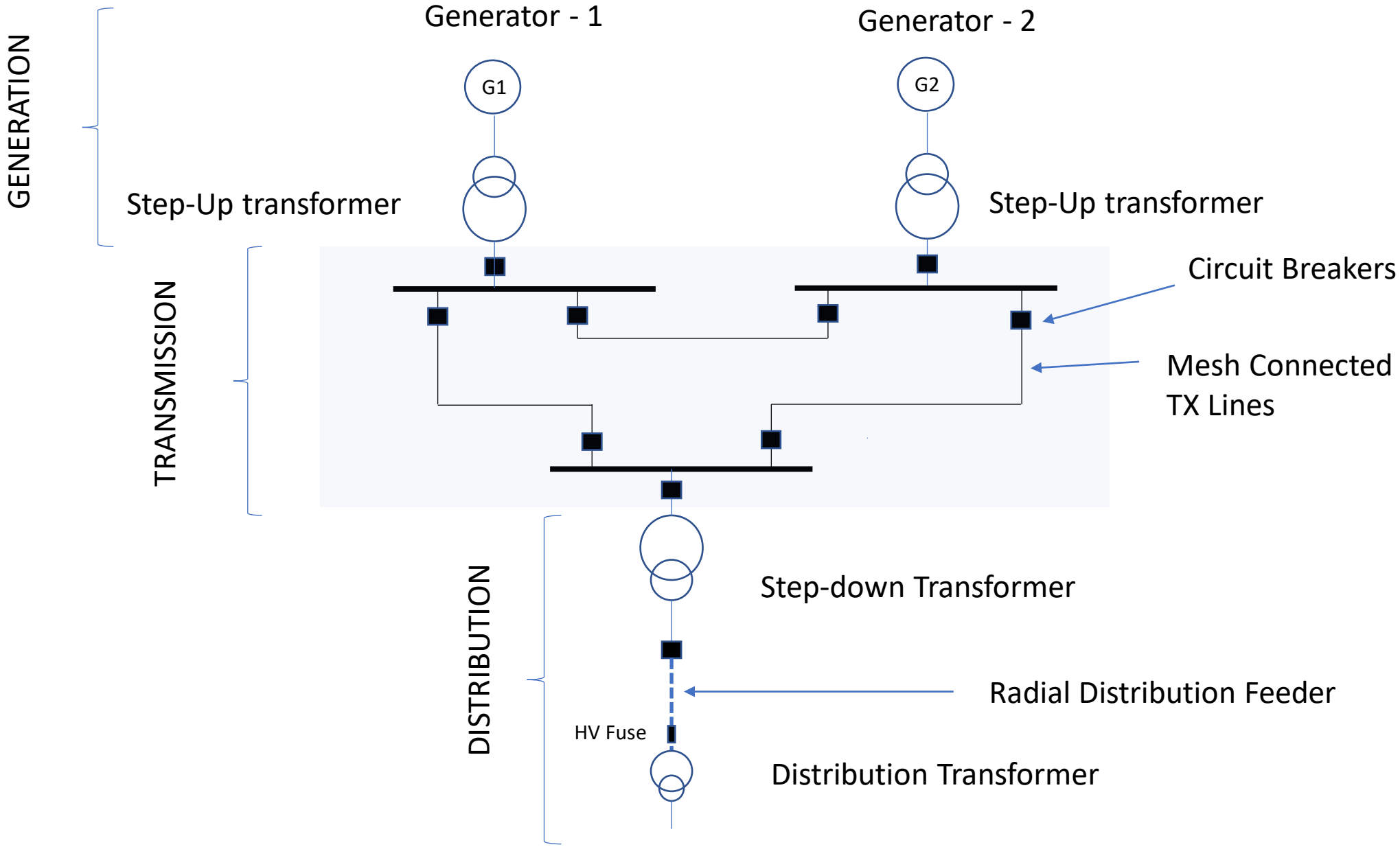
Power Distribution System Overview

- Overview of existing grid (transmission , generation, Distribution)
- Distribution Transformer Station.
- Distribution feeder and critical Equipment.
- Important terms related DER , short-circuit capacity, thermal capacity, islanding, anti islanding and temporary over voltages.

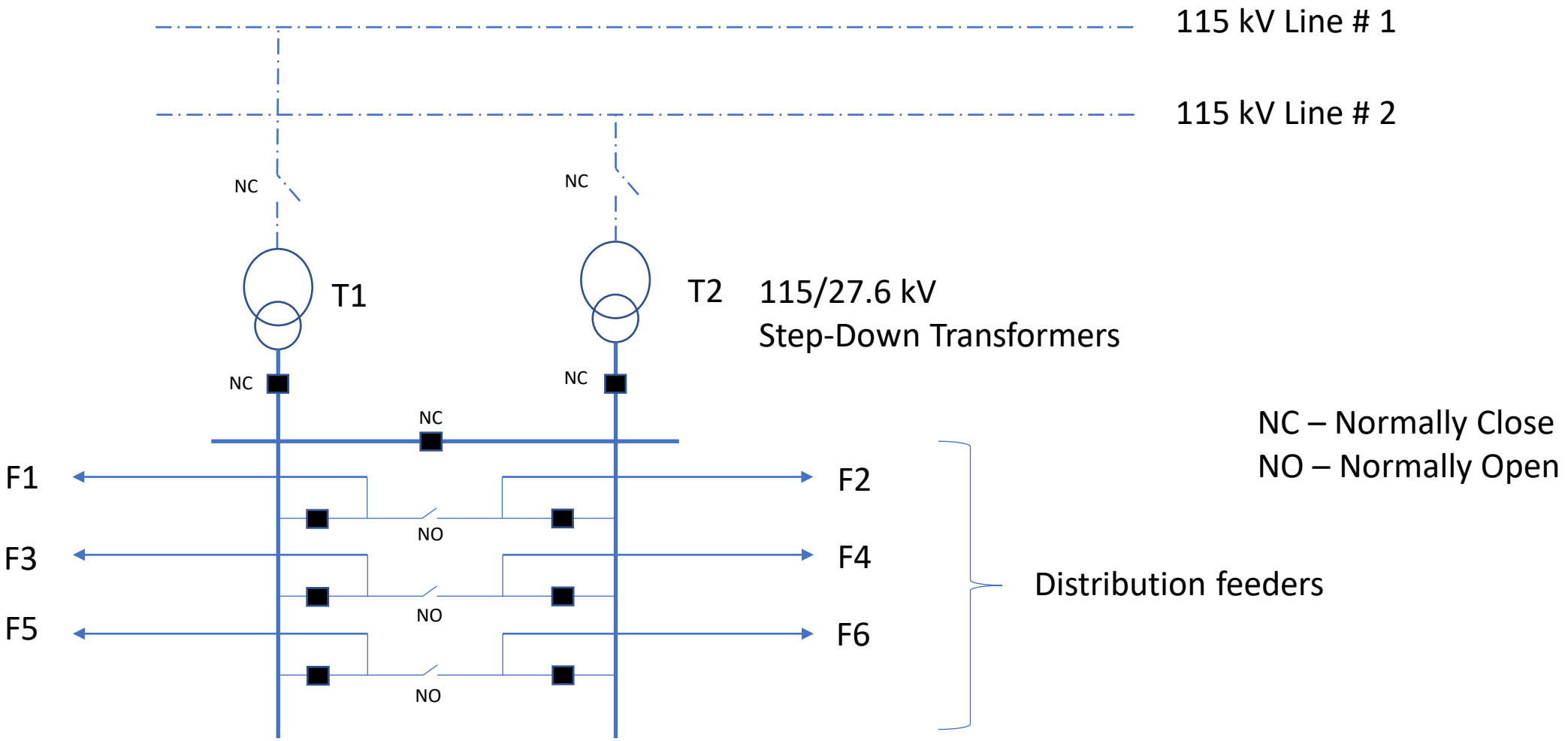
Traditional Power System



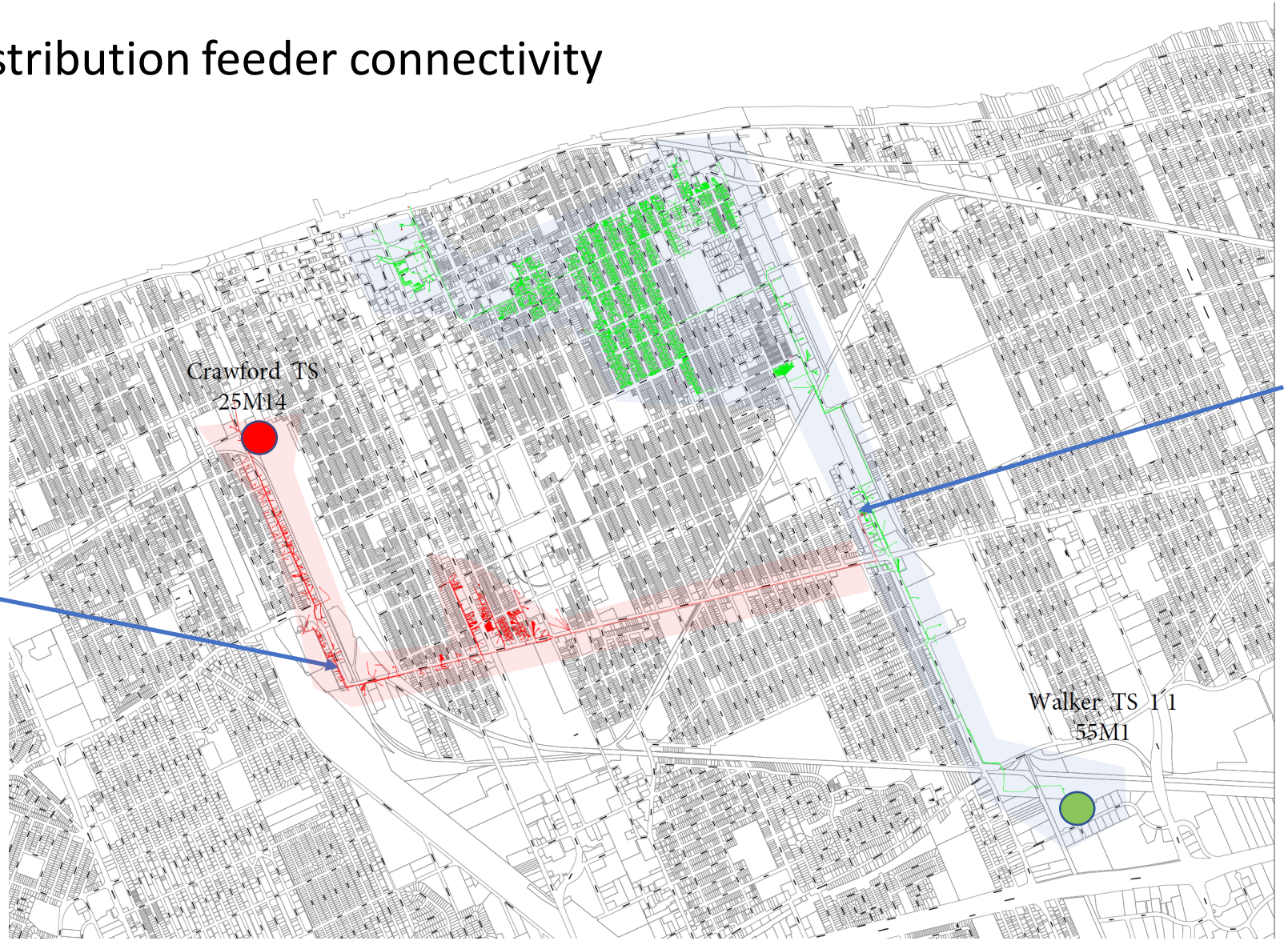



GENERATION
Generator - 1
Generator - 2
G1
G2
Step-Up transformer
Step-Up transformer
TRANSMISSION
Circuit Breakers
Mesh Connected
TX Lines
DISTRIBUTION
Step-down Transformer
Radial Distribution Feeder
HV Fuse
Distribution Transformer

Distribution Transformer Station Typical Arrangement



Distribution feeder connectivity



Remote operable
Mid point Recloser
25M25-RC1
Normally close

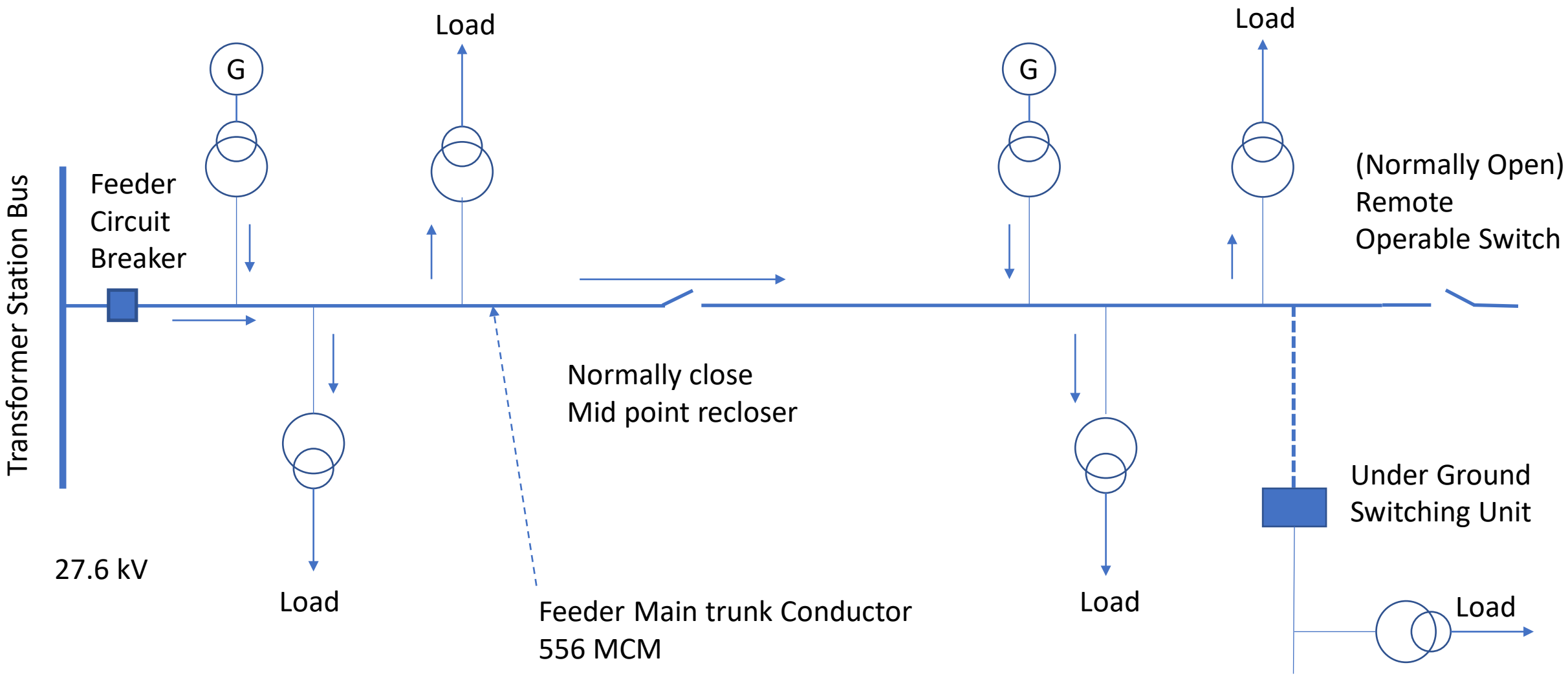
Remote Operable
Feeder Tie
25M14 –MS-55M1
Normally Open

Off Loading a Transformer Stations

Remote operable
Mid point Recloser
25M25-RC1
Normally close
(Open)

Remote Operable
Feeder Tie
25M14 –MS-55M1
Normally Open
(Close)

Typical Feeder schematic



Protective & Isolation Equipment in the Distribution feeder

34.5 kV, 1200 A
Feeder Breaker

34.5 kV , 630 A
Recloser

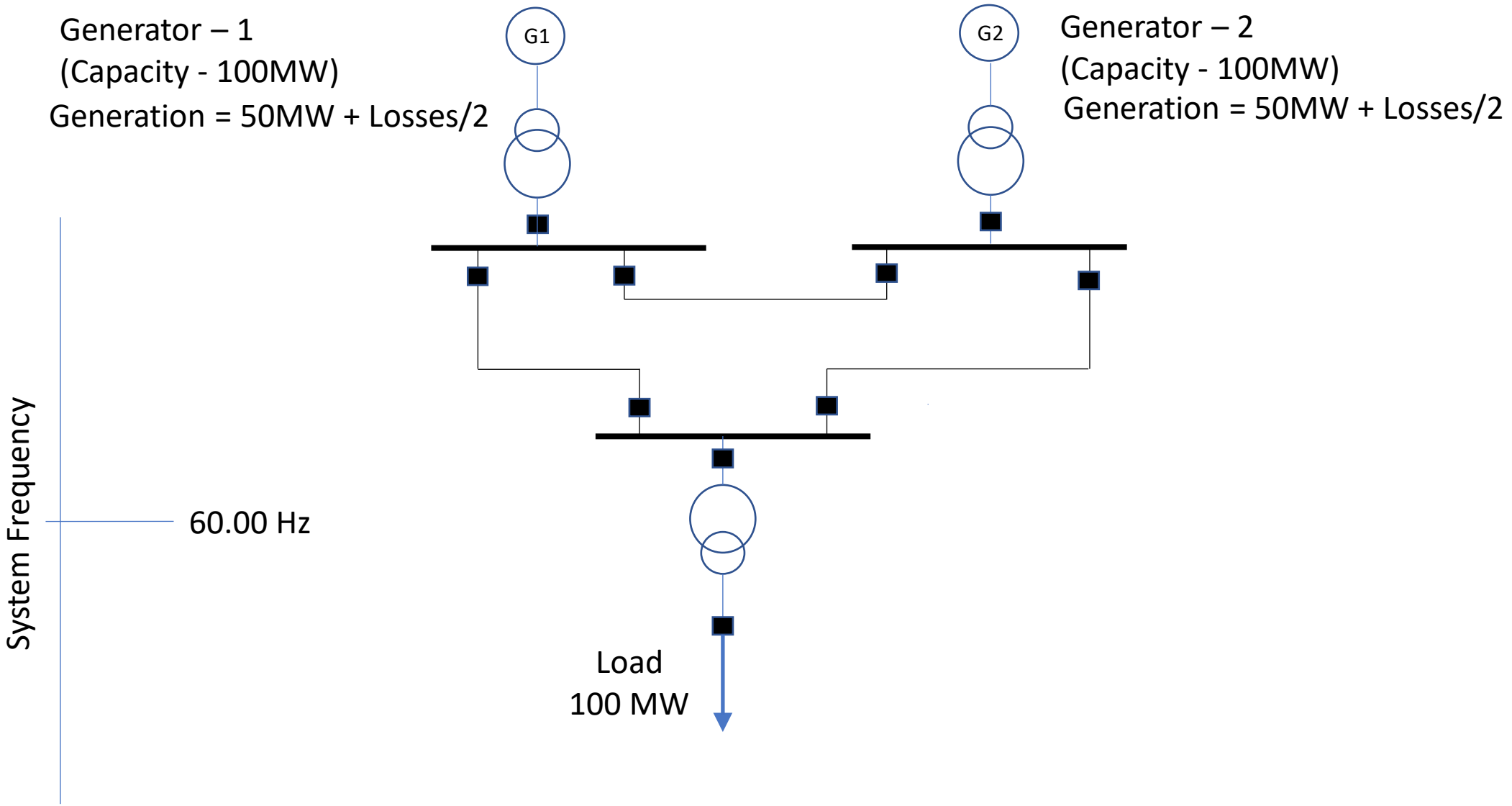
34.5 kV, 600 A
Motorized Switch

27.6kV, 600A
Manual Switch

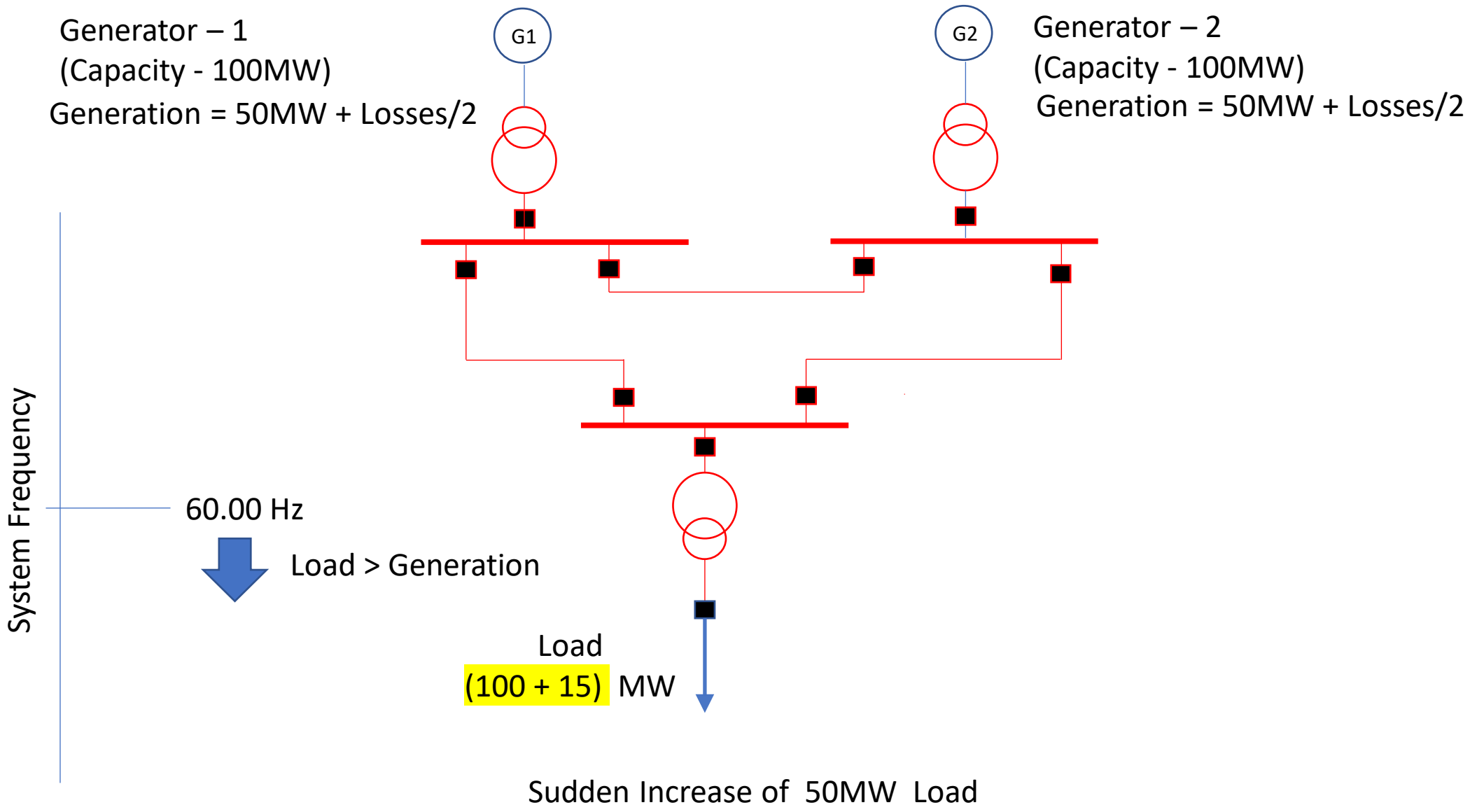
Dynamic behavior of the power system and Important terms related DER

- Frequency response to the load change
- Short circuit Capacity of a Transformer Station
- Thermal Capacity of a Transformer Station
- Islanding of a power system
- Remote trip requirement for Anti Islanding
- Temporary Over Voltage of distribution system

Frequency response to the load change



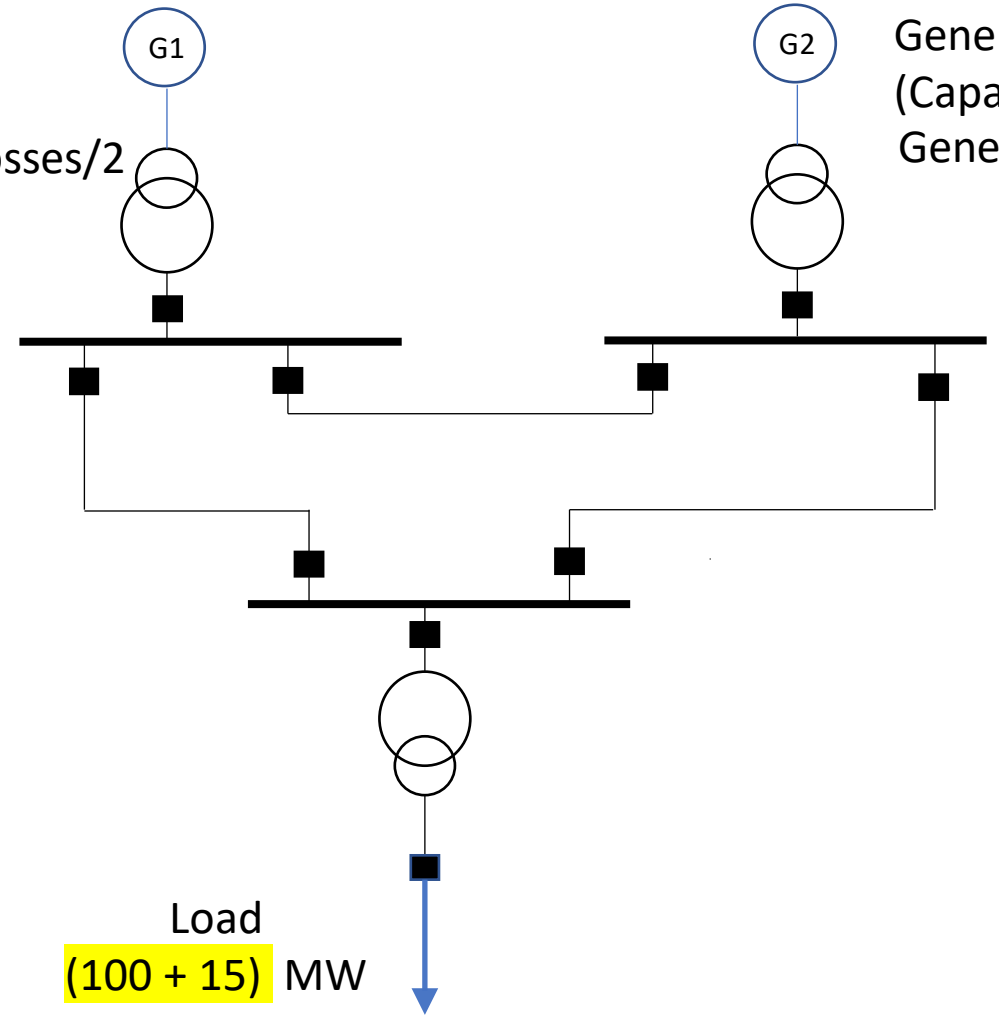
Frequency response to the load change



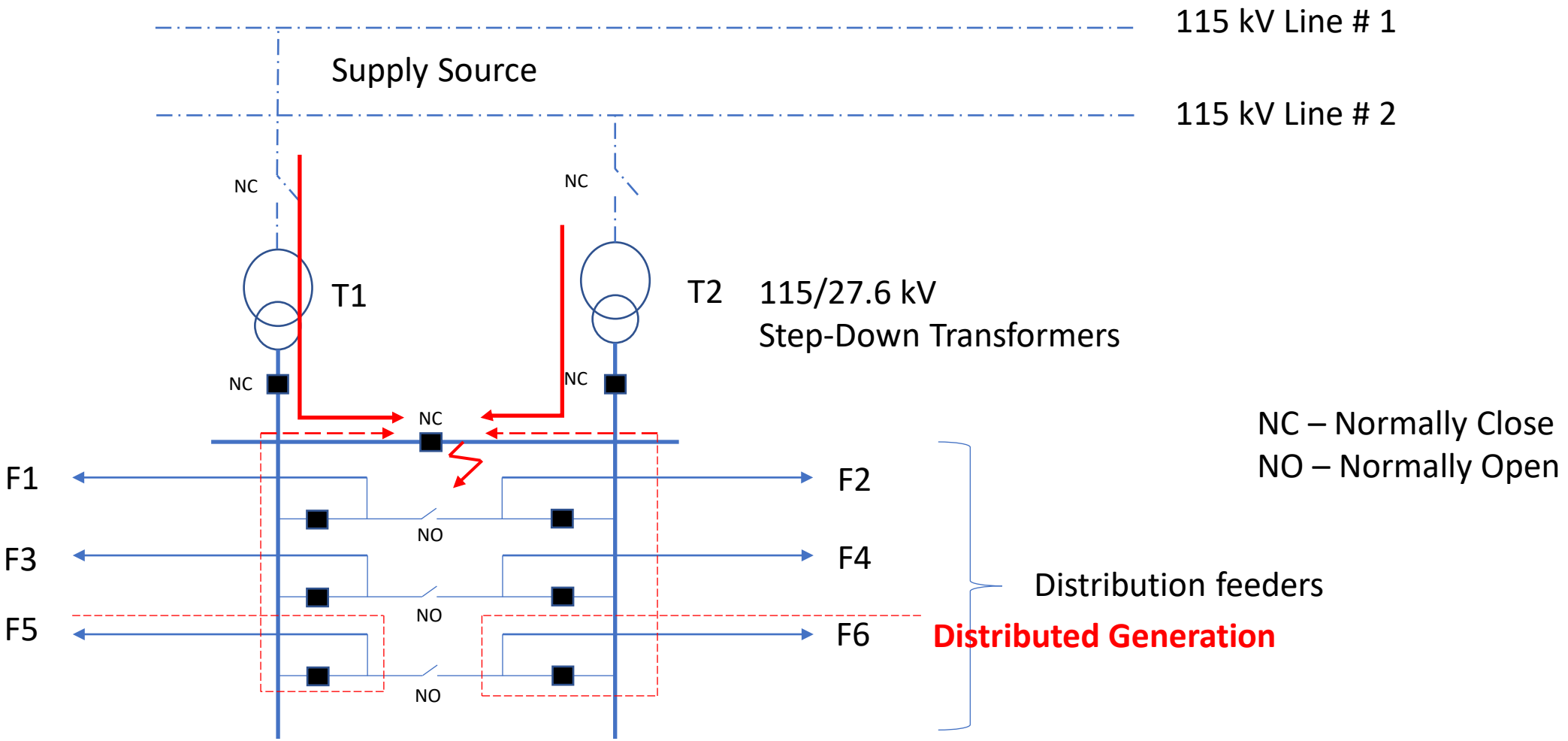
Frequency response to the load change

Generator – 1
(Capacity - 100MW)
Generation = (50 + 7.5) MW + Losses/2

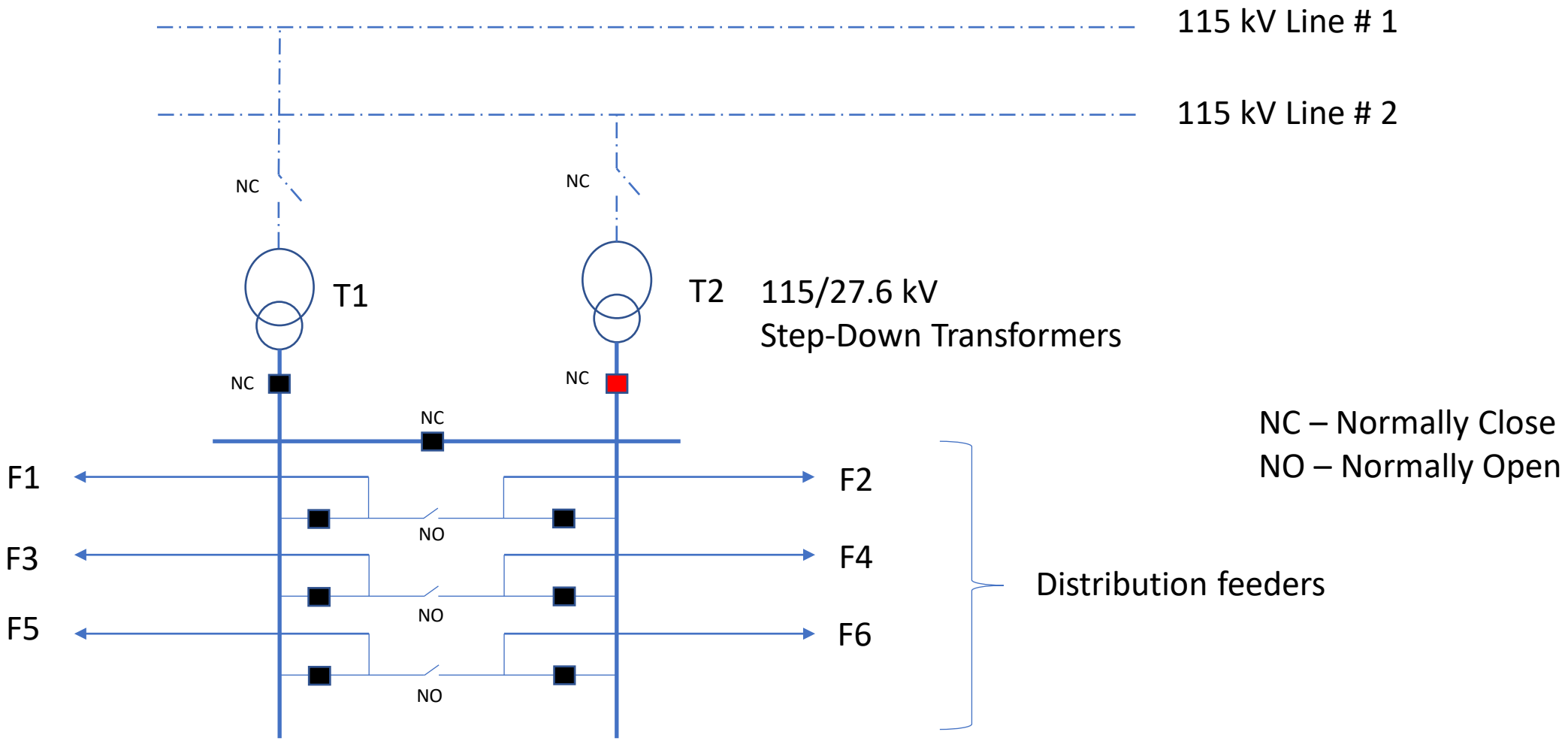
Generator – 2
(Capacity - 100MW)
Generation = (50+ 7.5)MW + Losses/2



Short circuit Capacity of a Transformer Station



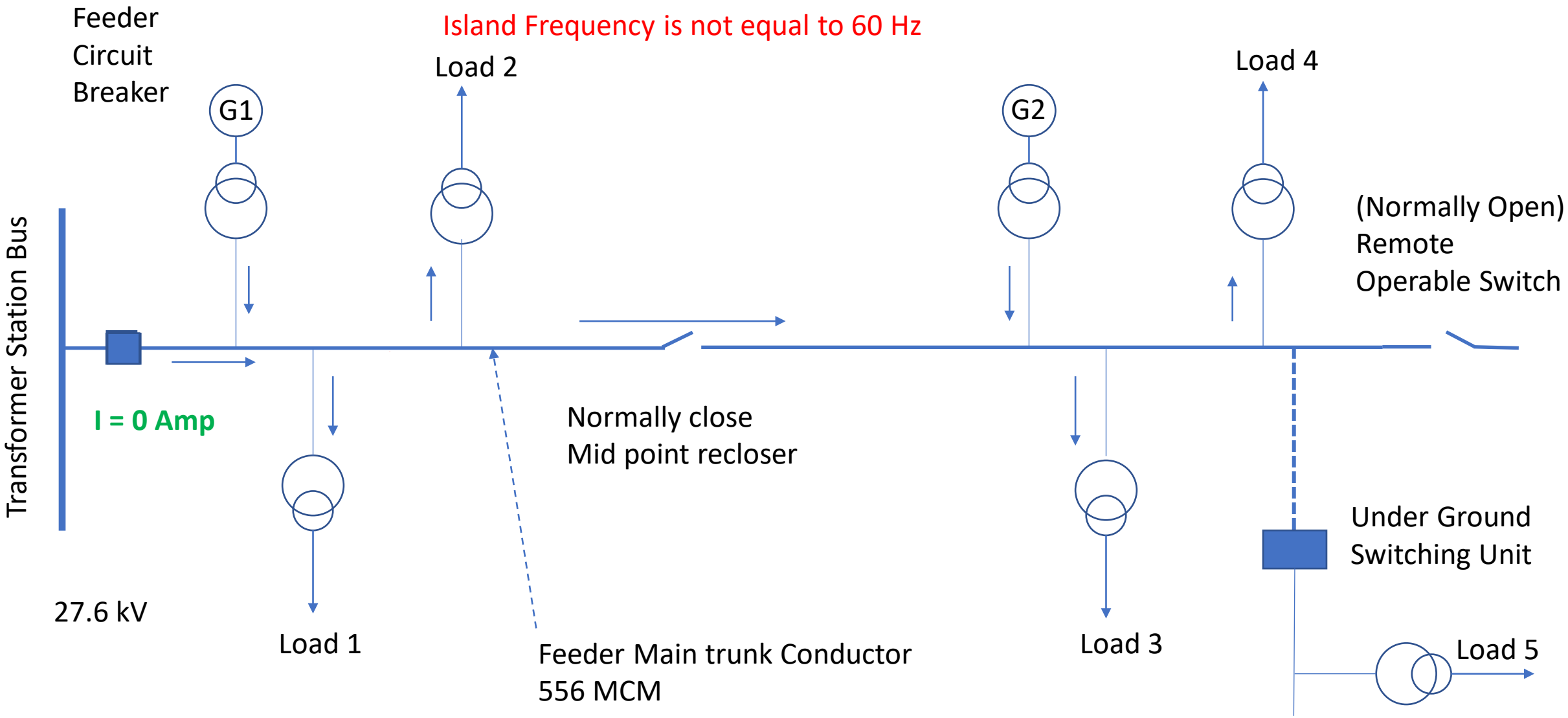
Thermal Capacity of a Transformer Station



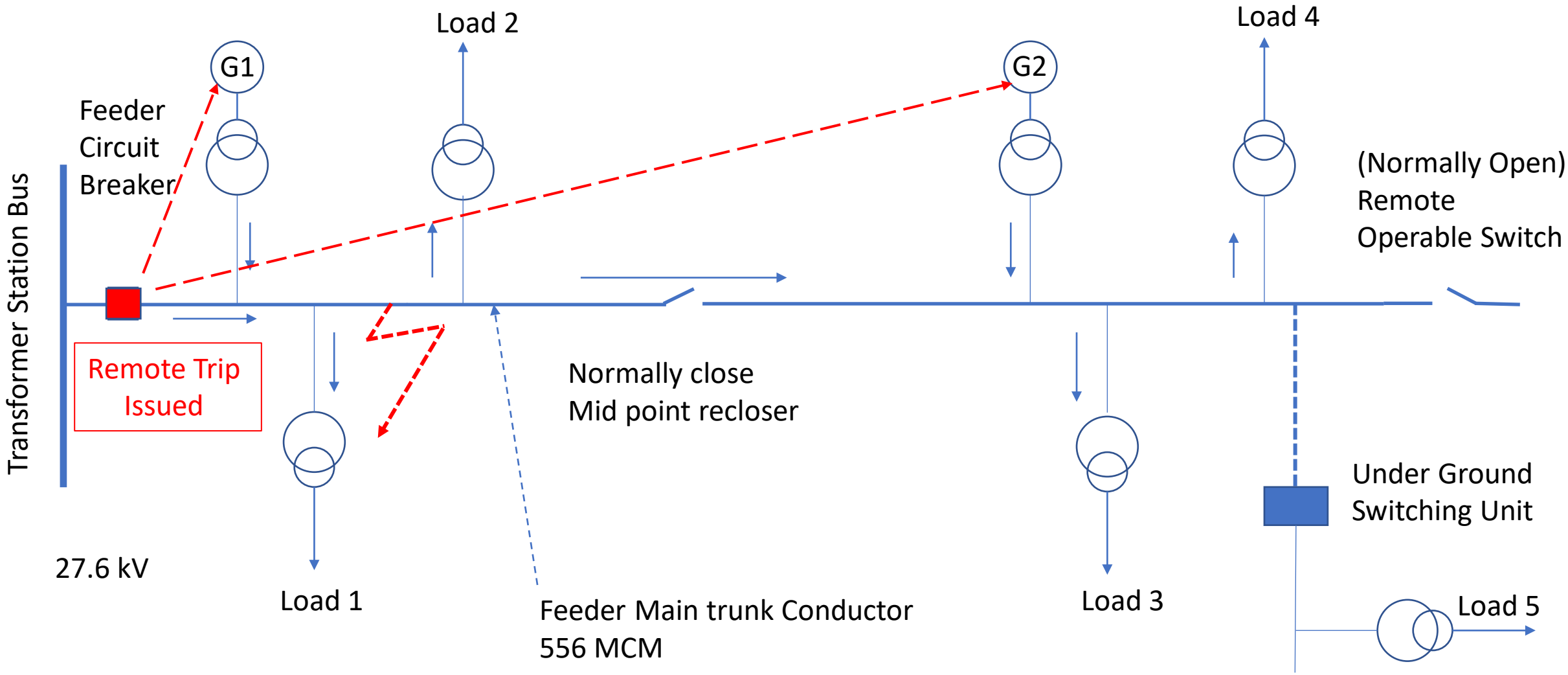
Islanding of a power system

G1+G2 = Load 1 + Load 2 + Load 3 + Load 4 + Load 5

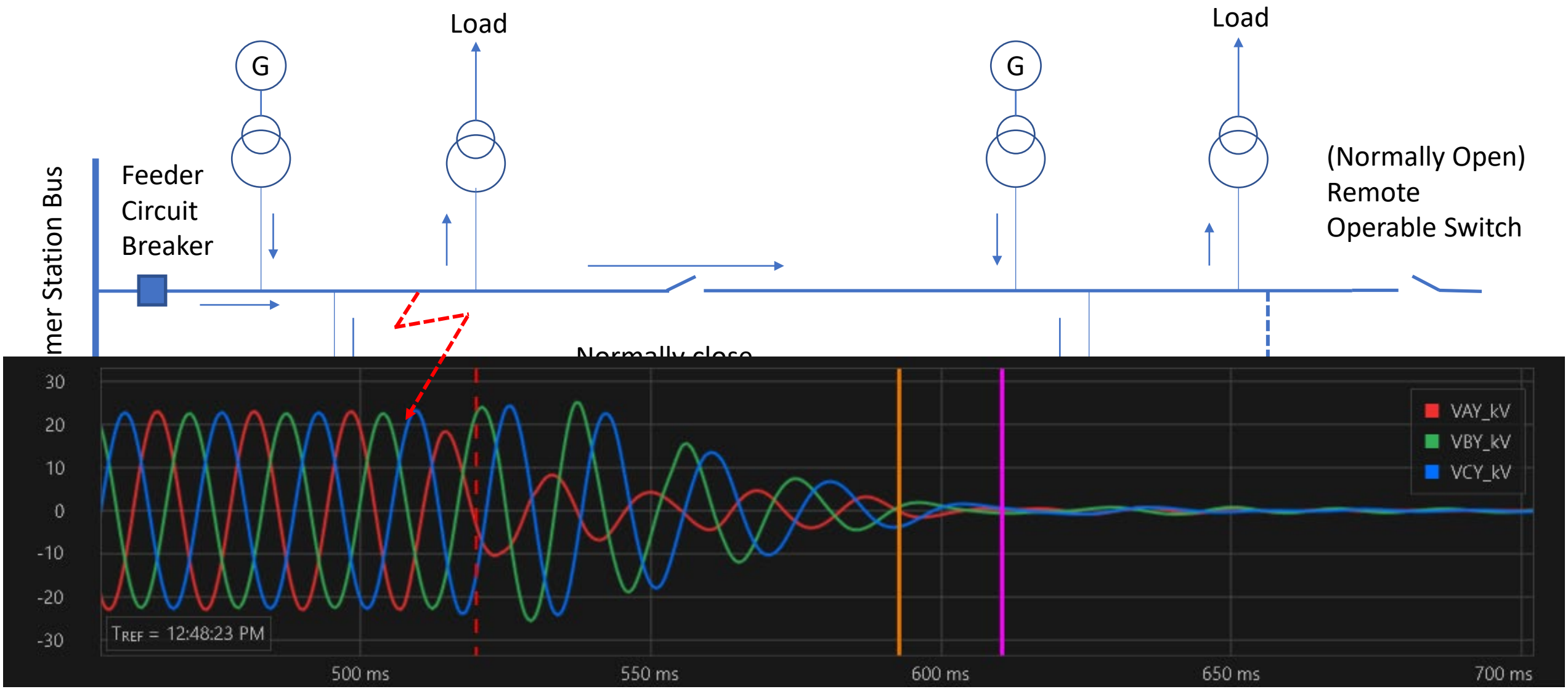
Island Frequency is not equal to 60 Hz



Remote trip requirement for Anti Islanding



Temporary Over Voltage of distribution system



Thank you