Sectos SF_6 Load Breaking Switch NXBD and Latest Application for Distribution Network

ARHADI FAJAR PERKASA

ABB

Indonesia Distribution

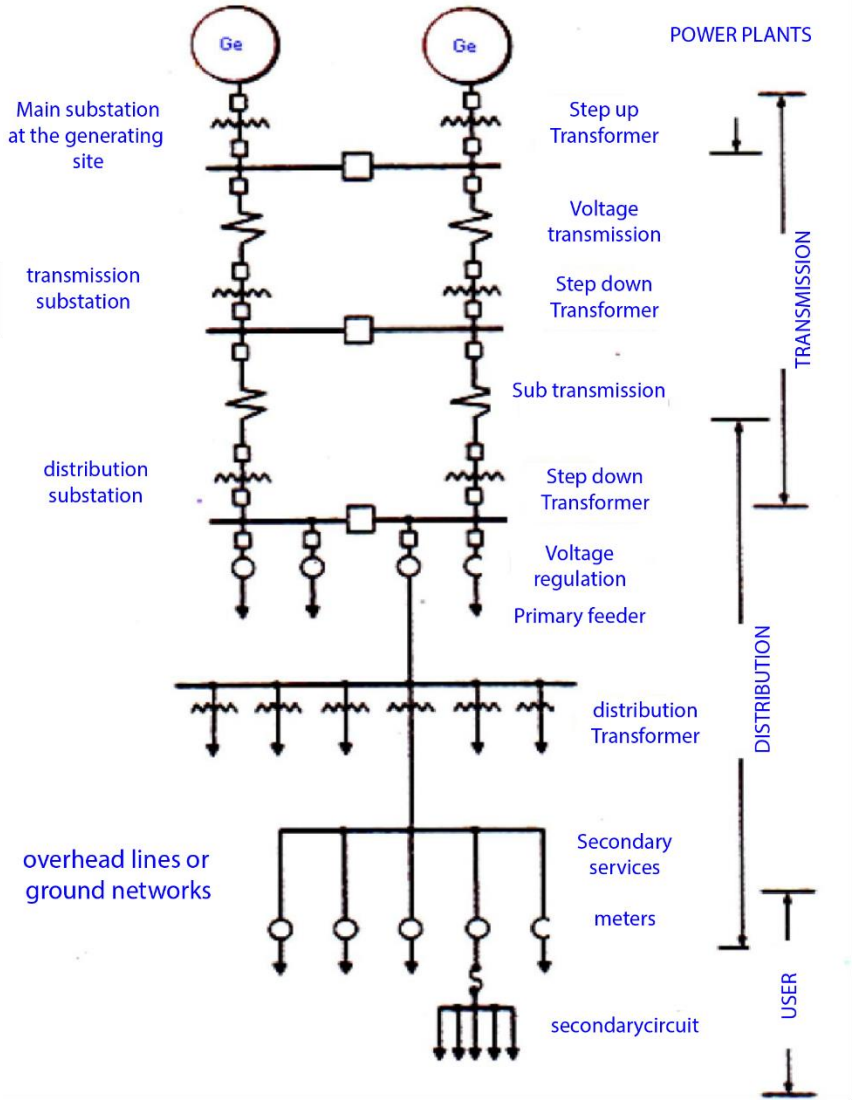
System Overview

Distribution System

- This distribution system is useful for distributing electrical power from large electrical resources (Bulk Power Source) to consumers.

- So the function of electric power distribution is: dividing or distributing electric power to several places (customers) is an electric power sub system that is directly connected to customers, because the power supply at load centers (customers) is served directly through the distribution network.

Classification of Electric Power System



- **Zone I**
  : Generation Section
- **Zone II**
  : Transmission Section, High (HV,UHV,EHV)
- **Zone III**
  : Primary Distribution Section, Medium Voltage (6 or 20kV).
- **Zone IV**
  : (Inside buildings at loads/consumers), Installation, low voltage

Scope of Distribution Network

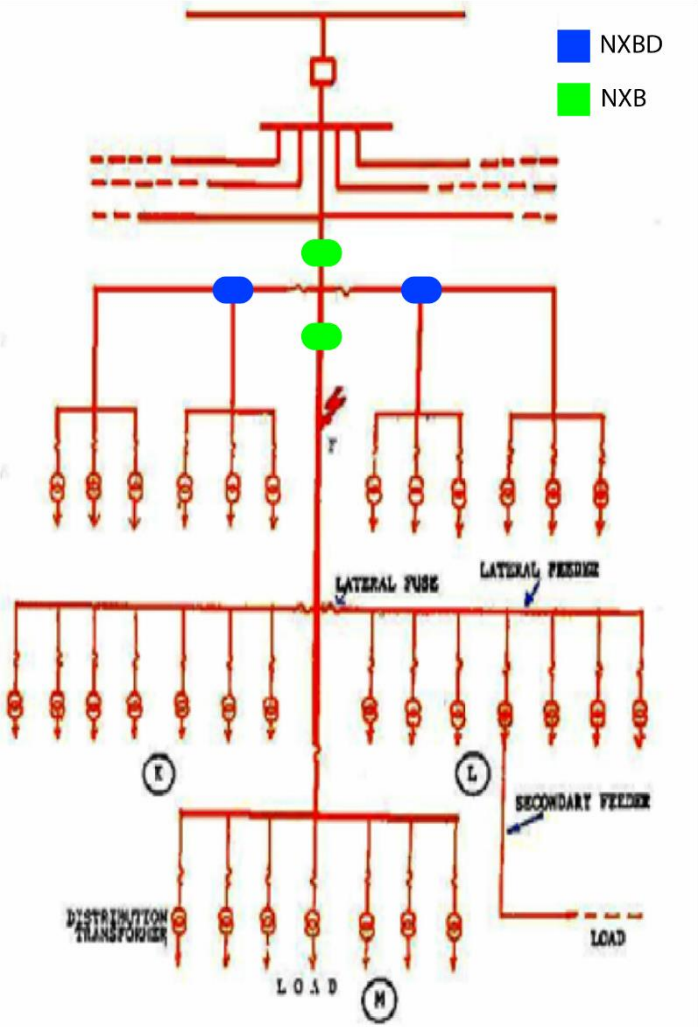
1. **Medium Voltage Air Lines, consisting of:**
   Poles, Connector, conductors, as well as safety and breaker equipment.
2. **Medium Voltage Cable Channels, consisting of:**
   Ground cables, Cubicle, indoor and outdoor terminations and others
3. **The transformer substation consists of:**
   Transformer, poles, pole foundations, frame for the transformer, panels, protective pipes, arresters, cables, grounding equipment, etc.
4. **Low Voltage Air Ducts and Low Voltage Cable Ducts, consisting of:**
   the same as equipment/materials in Medium Voltage Air Lines and Cable Channels. The only difference is the dimensions

Distribution System According to Network Arrangement

- ***Primary Distribution System Network Series***, namely:
  - ✓ Radial Distribution Network, with models:
    - Tree type Radial,
    - Radial with ties and separating switches,
  - ✓ Ring (loop) distribution network with models:
    - Open loop form and Close loop form.
  - ✓ Network distribution network (NET)
  - ✓ Spindle distribution network
  - ✓ Radial Channel Interconnection
- ***Secondary Distribution System Network***, In the secondary distribution system, the most widely used channel form is the radial system. This system can use insulated cables or conductors without insulation

Opportunity for Using Load Break Switch in Distribution Network Model

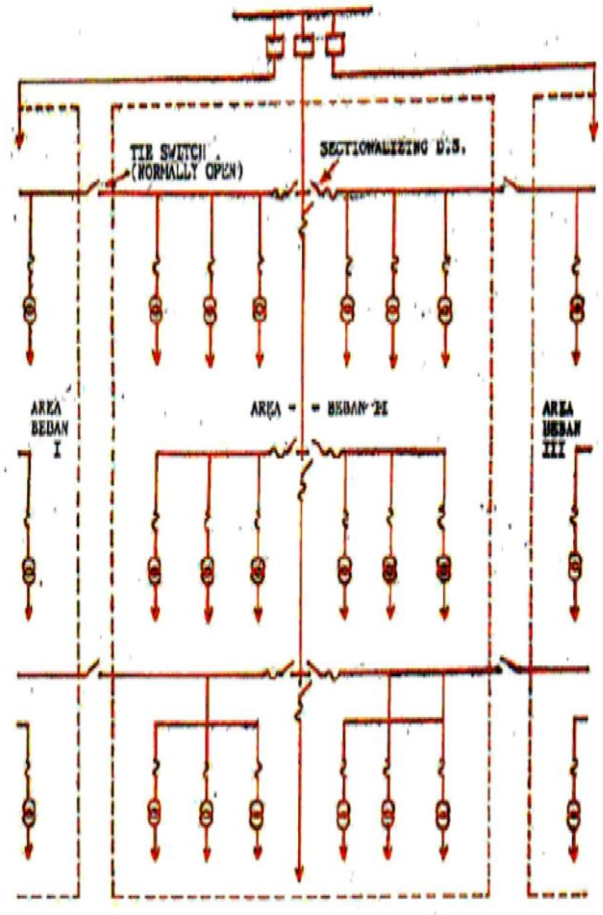
Radial Distribution Network with model Tree Type Radial



- This form is the most basic form. One main channel is stretched according to its needs, then branched with branch channels and further branched with sublateral feeders.
- According to the current density carried by each channel, the size of the main feeder is the largest, the size of the lateral is smaller than the main feeder, and the size of the sub lateral is the smallest.
- Load Break Switch can be placed at the branch or the main feeder as sectionalizer.
- All network as air duct medium voltage.

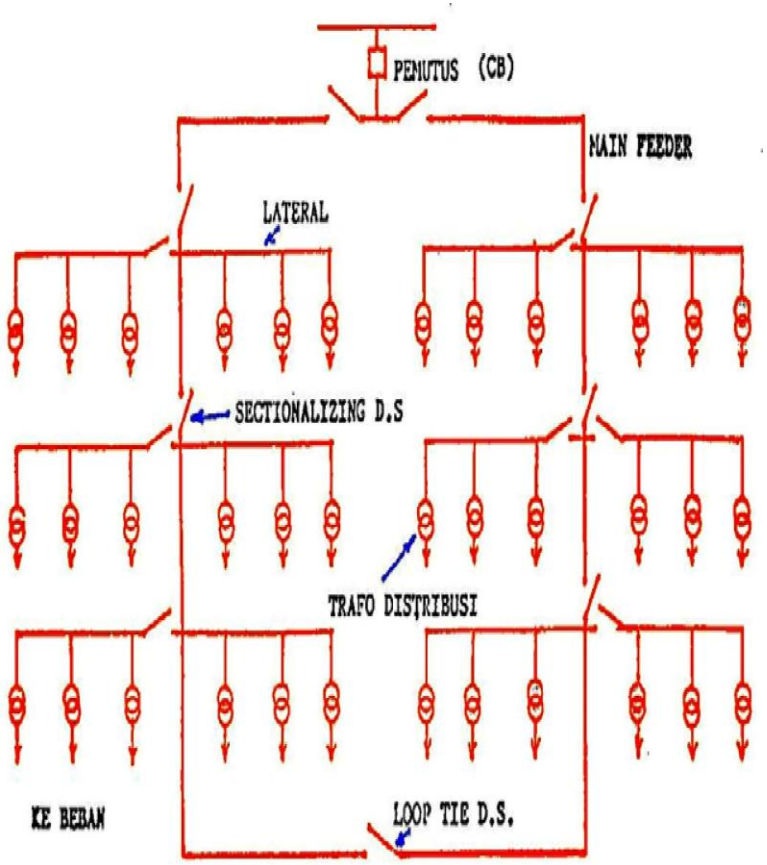
Radial Distribution Network with model:

Radial with ties and separating switches



- This form is a modification of the basic form by adding ties and separating switches, which are needed to speed up service recovery for consumers, by connecting undisturbed areas on the feeder in question, with the surrounding feeders.
- In this way, the disturbed feeder part is localized, and other "healthy" feeder parts can immediately be operated again, by removing the switch connected to the fault point, and connecting the healthy feeder part to the surrounding feeder
- LBS can be placed at tie switch, sectionalizing, branch and main feeder.
- All network as air duct medium voltage.

Ring (loop) distribution network models



- If at the load point there are two alternative channels originating from more than one source. This network is a closed form, also called a "loop" network form. The arrangement of the feeder circuit forms a ring, which allows load points to be served from two feeder directions, so that continuity of service is more guaranteed, and the power quality is better, because voltage losses and power losses on the line are smaller
- LBS can be placed at Main Feeder, sectionalizing and loop tie
- All network as air duct medium voltage

Installation and Operation

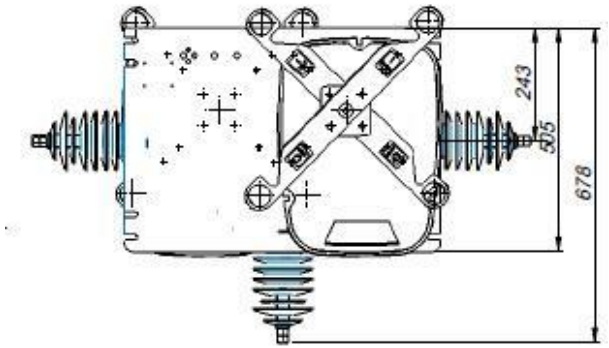
Installation & Operation

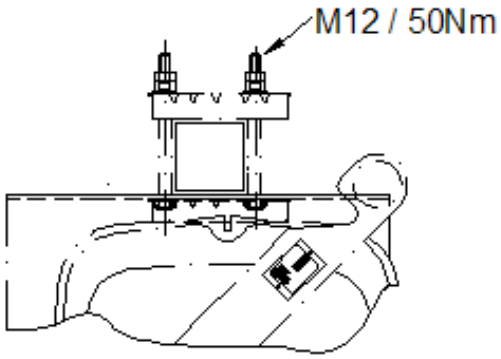
Installation

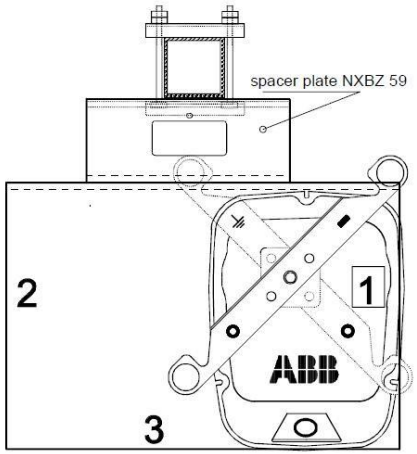
- Be easy to mounted below the crossarm
- Standard accessories:

  Fixing clamp *NXAM1* for 80mm a100mm

  Mounting spacer *NXBZ59*

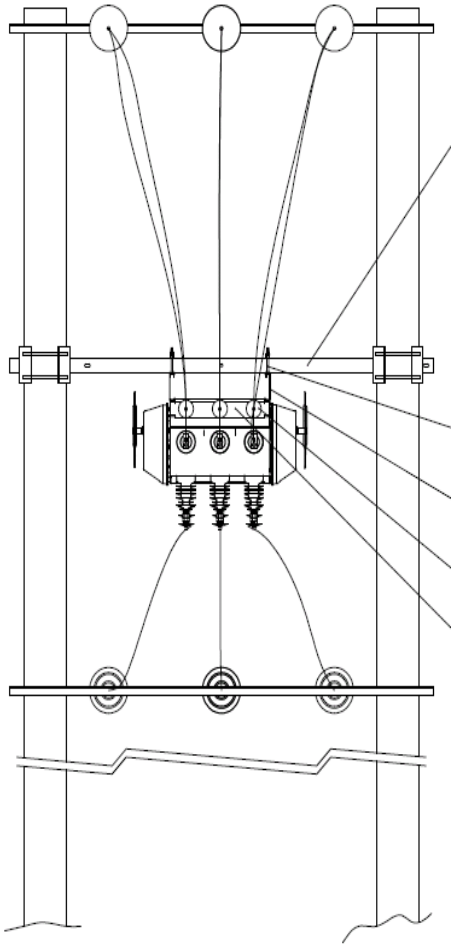


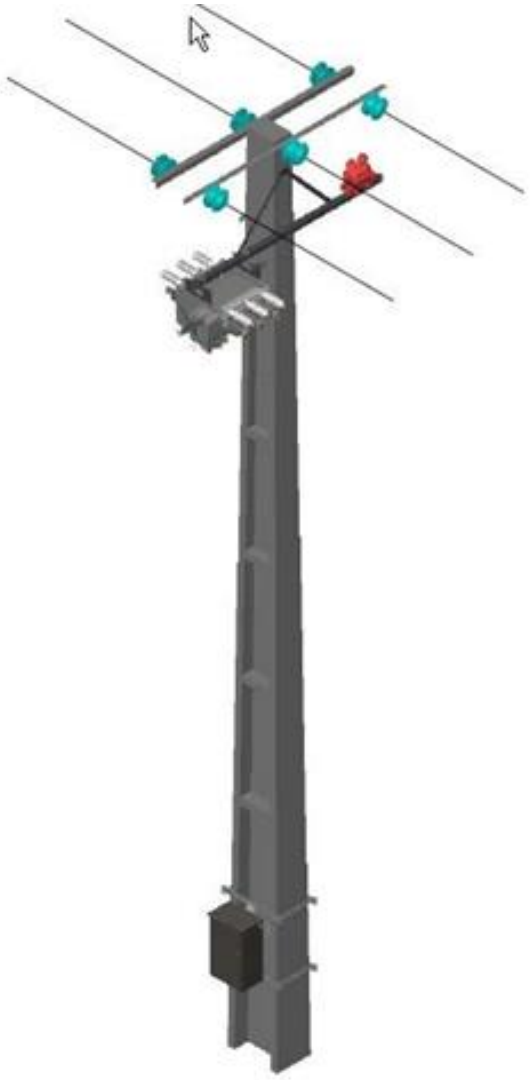




Installation & Operation

Installation





Installation & Operation

Installation

Installation & Operation

Installation

Installation & Operation

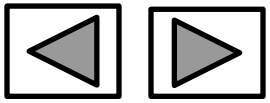
Installation

Operate by hook stick

Motor Up

Automation Model

Can Be Implemented



Automation Model for Operation

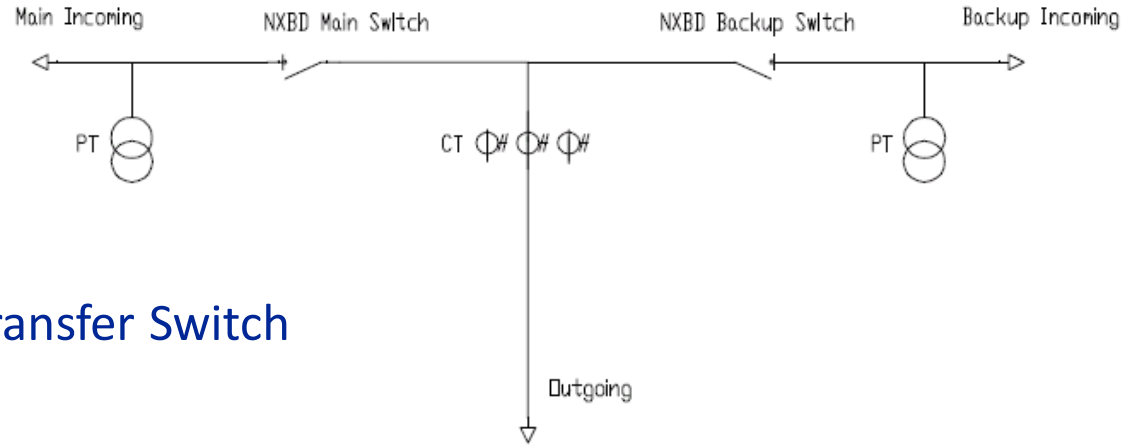
1. Feeder Automation
2. Sectionalizer Automation
3. Fault Detection Isolation and Restoration
4. Distribution Automation

Implementation in Indonesia

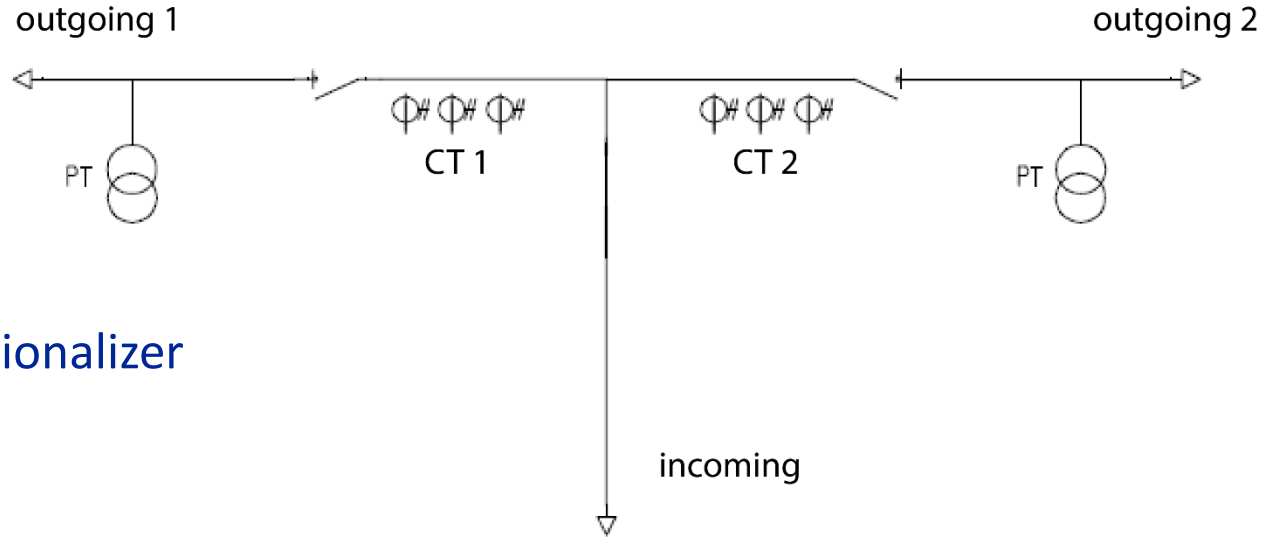
almost **1000 units NXBD** has been

installed in Indonesia since 2012

Application cases



Automatic Transfer Switch



Double sectionalizer

SUMATRA

Meulaboh, Aceh

Bandara MBO,
Sumatra Selatan

SUMATRA

Bengkulu

Jambi

KALIMANTAN

Kalimantan Timur

Kalimantan Barat

Implementation In Indonesia

JAWA

Yogyakarta

Semarang

Implementation In Indonesia

JAWA

Banten

Jawa Timur

NTT & BALI

Bali

NTT

SULAWESI & PAPUA

Sulawesi Selatan

Jayapura

Feature

NXBD Feature

One incoming LBS and Two Outgoing c/w double sectionalizer

Drivers

- ✓ Request for improvement of the quality of the power supply less and shorter outages.
- ✓ Need to improve the operational efficiency through improved tools for the network operators and the field crews
- ✓ Need to utilize the distribution network / improve the economy. Utilize the network more efficiently (transfer of active power)/ minimize the network losses and minimize the amount of energy not supplied
- ✓ Provide improved safety for the utility personnel. Less need to travel to places difficult to reach and less need to work in dangerous environments
- ✓ Normally a combination of the above

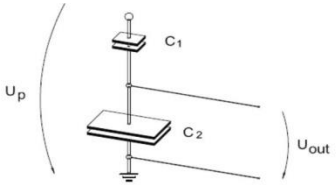
Feature NXBD:

One incoming LBS and Two Outgoing c/w double sectionalizer

Sectos capacitor voltage divider (CVD)sensor solution of NXB/NXBD

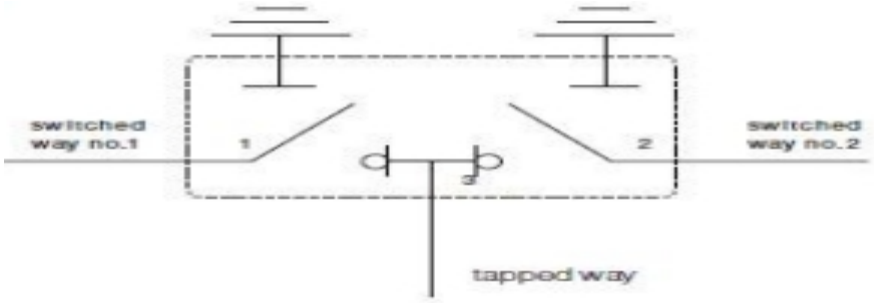
Advantage:

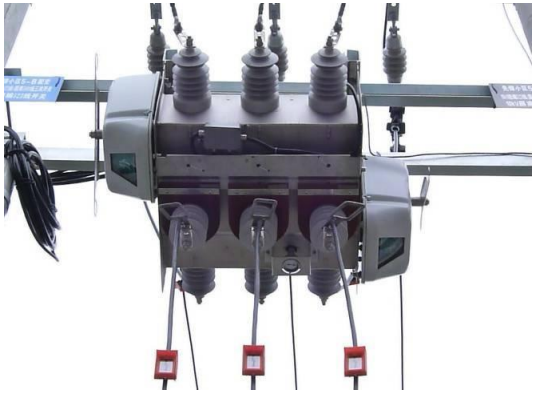
1. Compact design, easy to install
2. Low output, more safety
3. Up to 6 voltage measurements,
4. Technical parameter
   Ratio: Kn=10000:1
   Accuracy: 3%



$$u_{out} = \frac{C_1}{C_1 + C_2} u_p$$

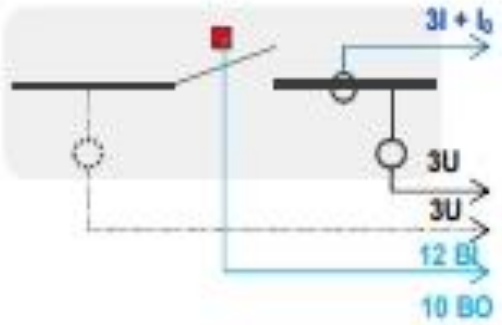
Automatic transfer application of NXBD :





Sectos NXBD Controller

LBS	IED Type	Input /Output Interface



REC615 Configuration A
(3 current transformer)
REC615 Configuration B
(3 current transformer+ 6 capacitive voltage dividers)
REC615 Configuration C
(3 Current & 3Voltage sensor)

Analogs/Inputs/Outputs
Conf A: 4 CT (Io 0.2/1A) + 3 VT 8 BI + 10 BO
Conf B: 4 CT (Io 0.2/1A) + 6 VD 12 BI + 10 BO3
Conf C: 3 Current sensor + 3 Voltage sensor + Io (0.2/1A) 8 BI + 10 BO
Optional I/Os 6 BI + 3 BO

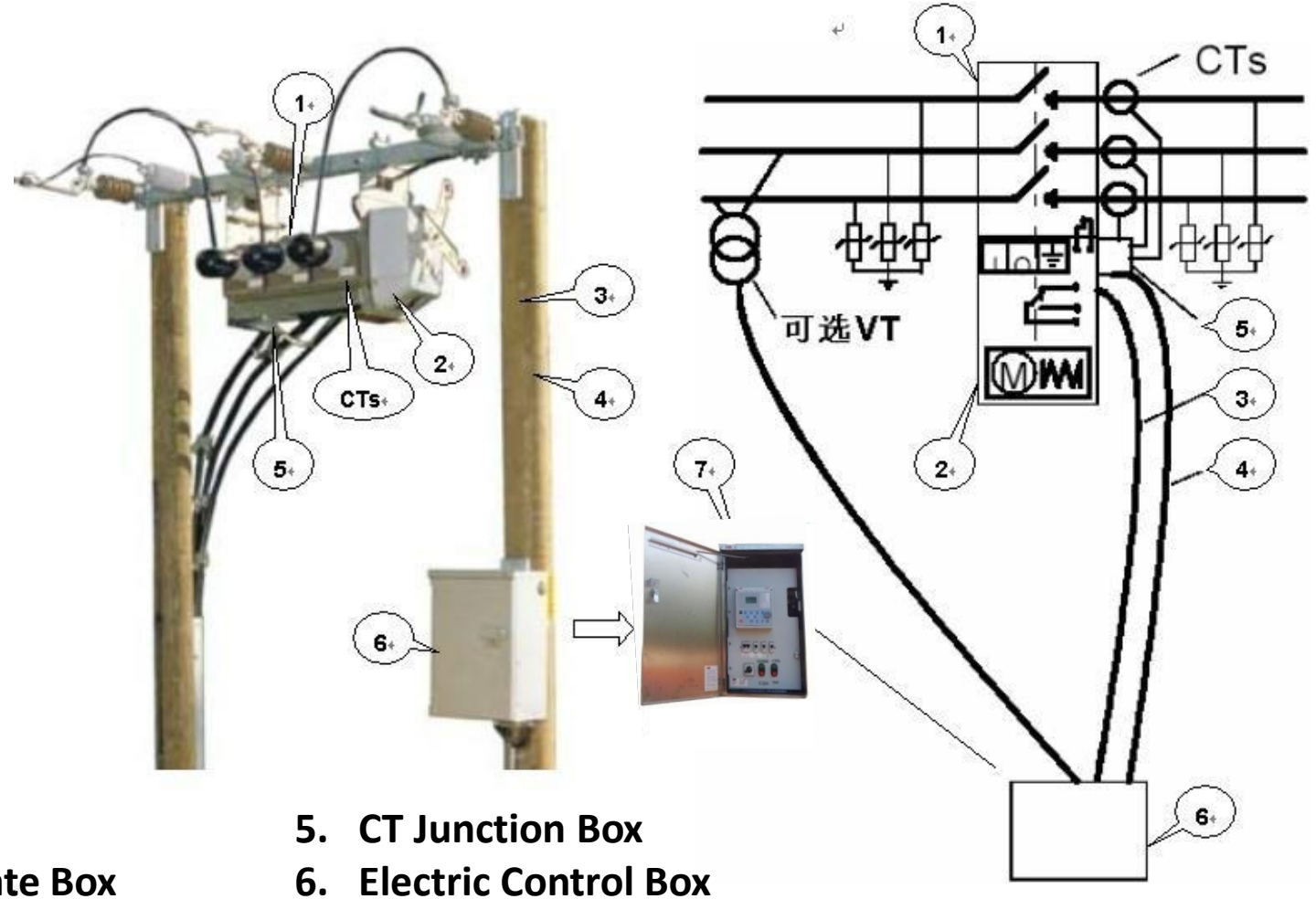
Communication Serial
RS 232/485 (including IRIG-B)
Glass fibre ST
RS 232/485 + RS485 (including IRIG-B)

Communication Ethernet
Ethernet 100Base FX (LC)
Ethernet 100Base TX (RJ45)
Ethernet 100Base TX (3xRJ45)
Ethernet 100Base FX (2xLC, 1xRJ45)

Communication Protocol
IEC 61850
IEC 61850 + IEC 101 (Slave) + IEC 104 (Slave)
IEC 61850 + DNP 3.0 (Slave) + Modbus (Slave)

Application for Distribution Automation

Application for Distribution Automation



1. Tank
2. Operate Box
3. Control Cable
4. CT Measure Cable
5. CT Junction Box
6. Electric Control Box
7. Control Unit

Application for Distribution Automation

Remote monitoring and control unit REC615

Measurement and data logging

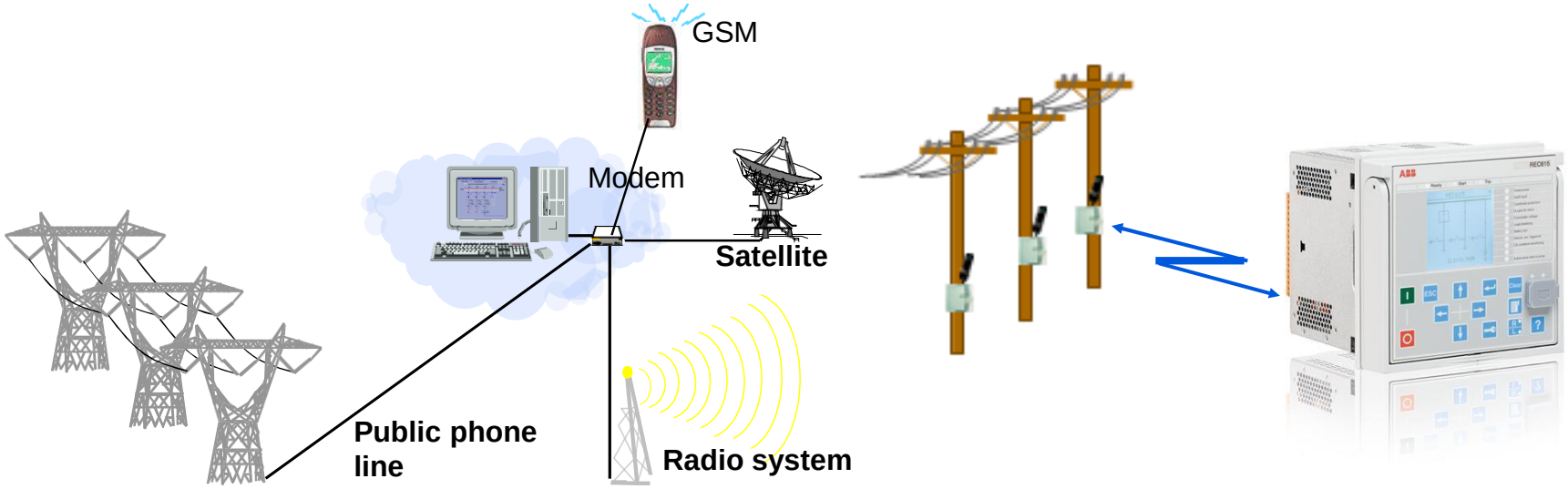
- phase currents and phase-to-phase-voltages
- residual current and voltage
- active and reactive power
- active and reactive energy
- demand values of current and power
- Frequency
- power factor
- Harmonics
- Temperature
- disturbance and event recording

Condition monitoring

- control circuit supervision
- circuit breaker / disconnector condition monitoring
- SF6 pressure of primary equipment
- battery condition monitoring
- battery deep discharge protection
- operation counter for primary equipment
- internal self-supervision of the unit

Application for Distribution Automation

Remote monitoring and control unit REC 615



Communication Media

- **Serial Cable**
- **Modem**
- **Conventional Radio**
- **Radio Modem**
- **DLC**
- **Cellular Phone**
- **other RS232 adaptable devices**

Communication Protocol

- **DNP 3.0**
- **IEC 870–5–101**

Summary NXBD and REC 615

- One incoming LBS and Two Outgoing c/w double sectionalizer is more powerfull for improvement of the quality of the power supply less and shorter outages.
- The ATS function allows LBS NXBD to work automatically from switches that were originally closed to open and switches that were open to closed. This function uses a voltage sensor as a detector.
- The Remote/SCADA function allows the NXBD LBS to be controlled remotely for example using a SCADA master with a radio or GSM network.
- The security function allows LBS NXBD to secure the network from damage resulting from over current or overload disturbances. This function uses the current sensor found on the NXBD LBS and generally the LBS is installed after the recloser.

Thank You