

**Control & Relay Protection Philosophy for
132kV Ranpur Sub-Station (132/66 kV System)**

A) Bus Bar Configuration

- 132kV System: - One Main bus with Bus Sectionalizer
- 66kV System: - One Main Bus with Section Isolator
- Isolator system
- 132kV System: - Two isolator configuration (One Bus isolators and a Line/TRF isolator)
- 66kV System: - Two isolator configuration (One Bus isolator and a Line isolator)

B) Control Voltage

- 110V DC

C) Control & Relay panels

- Conventional Control & Relay Panels to be mounted in Control Room.

D) PLCC panels

- PLCC/FOTE Panels to be mounted in PLCC Room.
- Hard wiring between Relay Panels and PLCC/FOTE Panels for carrier as well as direct trip interface.

E) Nos. of 132kV Bays & Bus bar Protection

- Feeder Bay – 04 Nos + 0 Nos. (Future)
- Transformer Bay 132/66kV HV – 02 Nos + 1 No. (Future)
- Bus Sectionalizer – 01 No.
- **Total bays for first phase – 07 Nos.**
- Future Bays – 01 No.
- **Total No. of Bays planned – 08 Nos.**
- **Bays to be connected to Bus Bar Protection in first phase - 07 Nos.**
- **Bus Bar Protection**
 - **Control Unit (Central Unit) - 24 Bays**
 - **Bay Units (Peripheral Unit) – 12 Nos.**

F) Nos. of 66kV Bays

- Feeder Bay – 04 Nos. + 0 Nos. (Future)
- Transformer Bay 132/66kV LV – 02 Nos + 1 No. Future
- Bus coupler Bay - 00 No.
- Station Transformer Bay – 00 No.
- Capacitor bank Bay – 00 No.
- **Total bays for first phase – 06 Nos.**
- Future Bays – 01 Nos.
- **Total No. of Bays planned – 07 Nos.**

Control Philosophy – <u>Ranpur</u> Sub-Station		
System	Controlling Device to be Adopted	Type of Controlling Device
132kV Bay	Conventional switches provided in C&R panel	Conventional switches
66kV Bay	Conventional switches provided in C&R panel	Conventional switches
132kV PT selection logic when one of the PT bay is under maintenance and 132kV Bus Sectionalizer is closed shall be considered.		

Protection Philosophy – Ranpur Sub-Station			
A) Feeder Protection			
Feeder	Protection to be Adopted		Type of Relay
132kV Feeders	1	Main Protection (Distance Protection)	Numerical Relay with IEC 61850 Edition 2 Protocol
	2	Directional O/C & E/F Protection (Backup Protection).	Numerical Relay with IEC 61850 Edition 2 Protocol
	3	Local Breaker Backup (LBB) Protection.	Integrated in Main-I Protection and Bus Bar protection
66kV Feeders	1	Directional O/C & E/F Protection	Numerical Relay with IEC 60870-5-103 Protocol
	2	Local Breaker Backup (LBB) Protection	Integrated in Directional O/C & E/F Protection
B) Power Transformer Protection			
Equipment	Protection to be Adopted		Type of Relay
132/66kV Transformer	1	Differential Protection	Numerical Relay with IEC 61850 Edition 2 Protocol
	2	Restricted Earth Fault Protection	Numerical Relays with IEC 61850 Edition 2 Protocol
	3	Directional O/C & E/F Protection (HV side)	Numerical Relays with IEC 61850 Edition 2 Protocol
	4	Direction O/C & E/F Protection (LV side)	Numerical Relays with DR and IEC 60870-5-103 Protocol
	5	Over Fluxing Protection	Integrated in Differential Protection
	6	Local Breaker Backup (LBB) Protection. - 132 kV side - 66kV Side	-Integrated in Differential Protection and Bus Bar protection - Integrated in Dir. O/C & E/F Protection
	7	Buchholz Relay	Integrated in Transformer. Auxiliary relay in protection panel.
	8	Pressure Relief Device	Integrated in Transformer. Auxiliary relay in protection panel.
	9	Oil & Winding. Temp. Alarm & Tripping	Integrated in Transformer. Auxiliary relay in protection panel.
	10	OLTC Oil Surge Relay	Integrated in Transformer. Auxiliary relay in protection panel.
	11	Oil Level Low Alarm	Integrated in Transformer. Auxiliary relay in protection panel.
	12	Transformer Cooling Troubles	Integrated in Transformer. Auxiliary relay in protection panel.

	13	Fire Protection System	Nitrogen Injection Fire Protection Scheme (NIFPS) and also Auxiliary relays in protection panels for NIFPS
C) Bus Sectionalizer Protection			
132kV Bus Sectionalizer	1	Non-Directional O/C & E/F Protection	Numerical Relay with IEC 61850 Edition 2 Protocol
	2	Local Breaker Backup (LBB) Protection.	Integrated in Non Dir. O/C & E/F Protection and Bus Bar protection.
D) Bus Bar Protection			
132kV Bus bar	1	Bus Differential Protection (Single scheme) 12- Bays, Extendable up to 24 Bays (i. e. Control Unit – 24 Bays)	Numerical Relay with IEC 61850 Edition 2 Protocol.
E) LBB Protection scheme			
132kV System	1	Main LBB – Internal function of Busbar Protection scheme.	
	2	Redundant LBB – Hard wired trip bus between Panels.	
66kV System	1	Hard wired trip bus between Panels.	
F) Disturbance Recorder & Event Loggers			
Integrated feature of protective relays is used to provide the information about the Disturbance and to log the events.			
G) GPS based Time Synchronizing Equipment			
132kV Substation is to be provided with IEC 61850 compatible Global Positioning System based Time Synchronizing Equipment to synchronize all the protections.			

Note: - All the Relay/IEDs on 132kV side shall be

- ✓ IEC 61850 Edition 2 compliant
- ✓ Cyber security (NERC CIP/ IEC 52351 / IEEE 1686 / IEC 62443) compliant