

# DAMODAR VALLEY CORPORATION

## COMMUNICATION WING

An integral part of  
Power Generation, Transmission - Distribution,  
Construction activity and infrastructure.

# coverage

- All the Thermal and Hydel Power Plants
- All the Sub-Stations including GOMD headquarters and Receiving stations
- Headquarter at Kolkata and Functional field-headquarter at Maithon.

# THERMAL POWER STATIONS OF DVC

<u>Stations</u>	<u>Capacity (MW)</u>	<u>Commissioned</u>
okaro-B	630 (=3X210)	3/86, 11/90, 8/93
handrapura	890 (=3X130 +2X250)	10/64,5/65,7/68 7/11 , 11/11
urgapur	350 (=1X140 +1X210)	12/66 ,9/82
leja	1840 (=4X210 +2X250 +1X500)	3/96,3/98,9/99 2/05,2/08, 9/08 8/11
STPS	<u>500</u> (=1X500)	5/12
total :	4210 MW	

# Hydel Power Stations of DVC

<u>Stations</u>	<u>Capacity (MW)</u>	<u>Commissioned</u>
Tilaiya	4 (=2X2)	2/53 , 7/53
Maithon	63.2 (=2X20 +1X23.2)	10/57, 3/58 12/58
Panchet	<u>80</u> (= 2X40)	12/59 , 3/91
<b>Total :</b>	<b>147.2 MW</b>	

# Transmission & Distribution System

Sub-Station : At 220 KV : 12 nos.

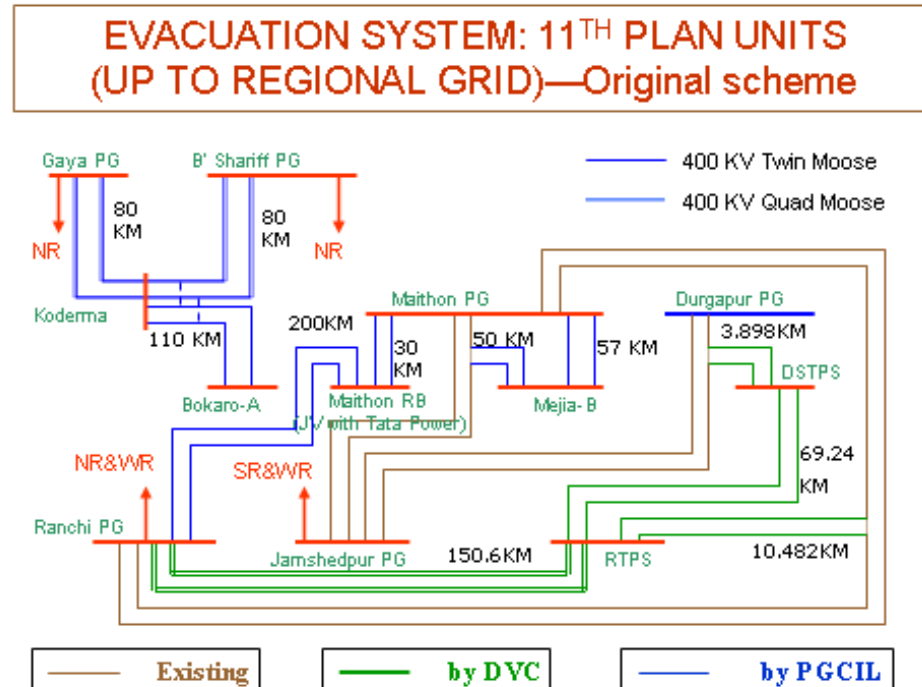
At 132 KV : 32 nos.

Transmission lines : At 220 KV: 1844 Ckt. Kms.

At 132 KV : 3555 Ckt. Kms.

Distribution lines : At 33 KV : 1349 Ckt. Kms.

# EVACUATION SYSTEM : 11<sup>TH</sup> PLAN UNITS (UP TO REGIONAL GRID- Original Scheme



# SERVICE PROVIDED

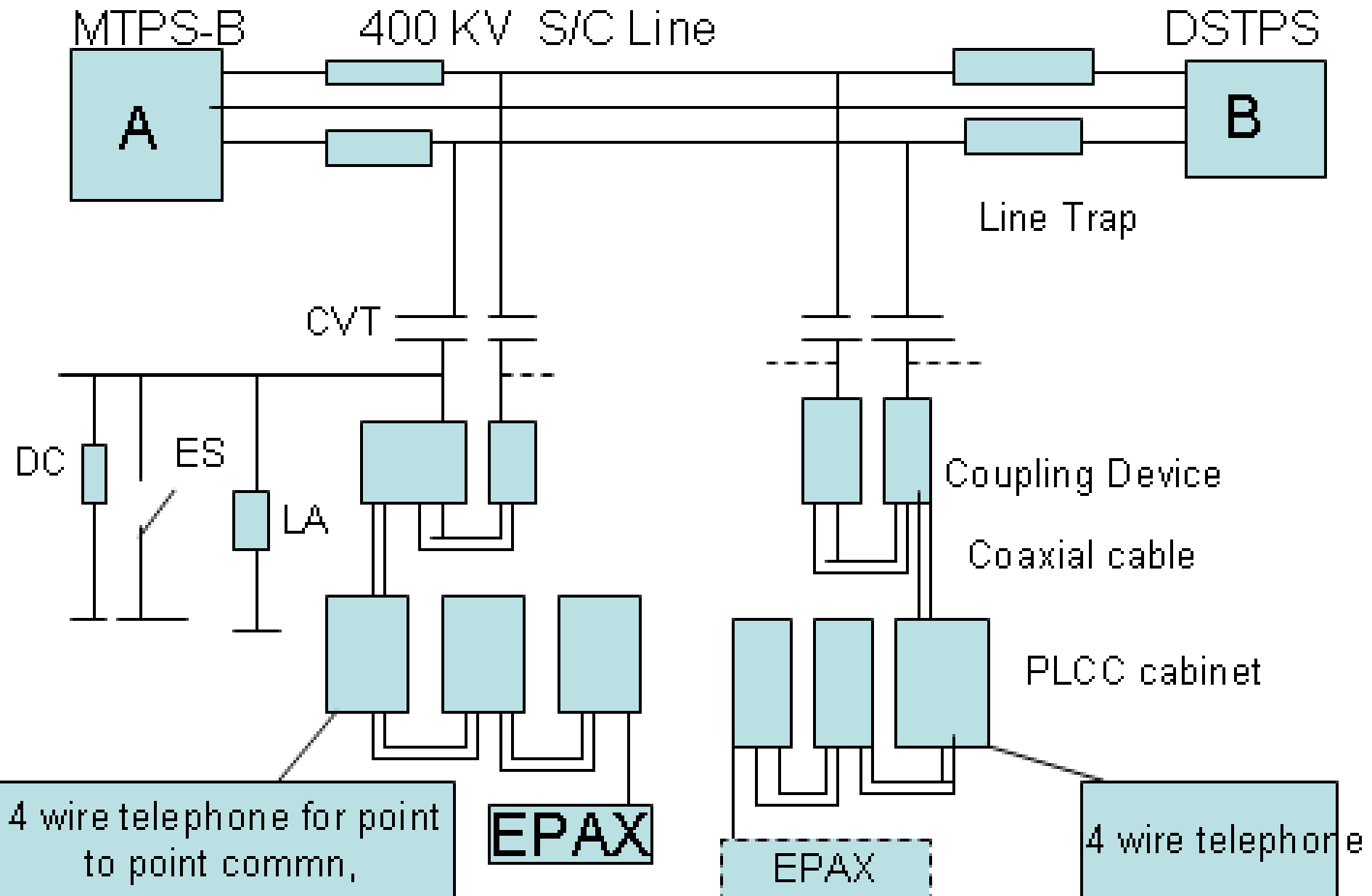
- Voice Communication
- Data Communication
- HV Carrier Protection
- Facsimile Link
- Internet and e-mail
- Wireless network
- EPABX & DID Facility
- PA System

# Communication Systems

- Power Line Carrier Communication (PLCC)
- VHF (Wireless) Network
- GSM data enabled SIM based RMR system for energy accounting & tariff
- Real Time EMS/SCADA System under ULDC Scheme over Hybrid Network
- Intercom system coupled with Trunk dialling (DOD & DID ) .



# PLCC (Power Line Carrier Commn.)



# Power Line Carrier Communication

- An effective system to utilise the High Voltage Power Line (132KV /220KV & 400KV) for Communication utility.
- Covers Thermal Stations, Hydel Stations and Sub-Stations spreading all over the valley.
- Latest Technology.
- Double Channel Programmable equipment are deployed for reliability.

# Advantage of PLCC system

- **Trunk dialing** utilising one channel of the twin channel PLCC in conjunction with PLCC-EPAX .
- **Point to Point communication** utilising another channel of PLCC terminal for two **adjacent stations** for ease of operation .
- **Tele metering** : Data communication (Speed : 50 / 100 / 200/300 / 600 baud )
- Carrier signal is used for tele-protection purpose (i.e **to protect the electrical equipment** providing tripping / blocking command to the remote end breakers in the event of fault on the transmission line .
- Most **cost effective** .Common media is the transmission line
- High Signal to Noise (S/N) ratio.
- Cross talk attenuation is **less than 60 dB** .
- It operates at **normal room temperature** .

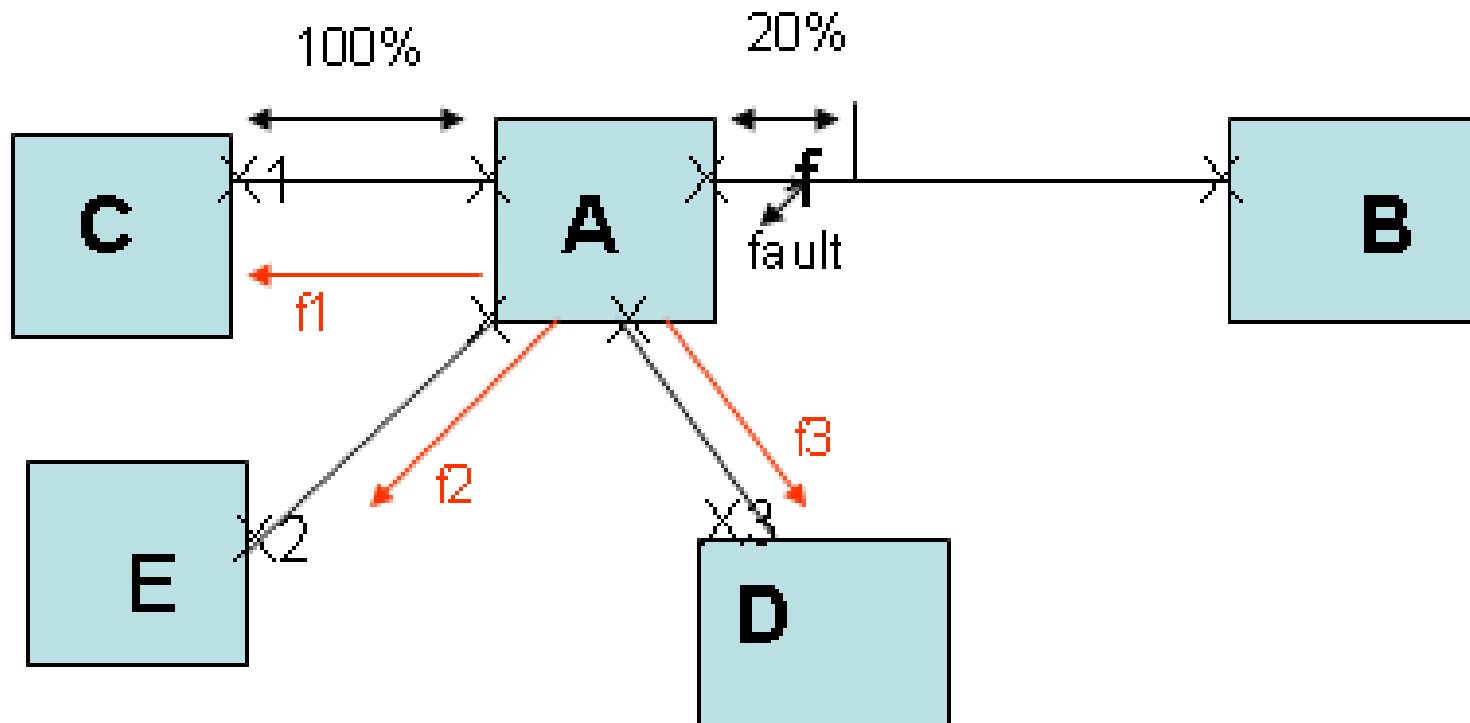
# Technology used in PLCC

- Double Channel, Amplitude modulated SSB system with reduced carrier for frequency sync. between two stations
- Low power consumption.
- Full Duplex channel.
- Programmable frequency using synthesiser.
- High S/N ratio.
- Cross talk attenuation less than 60db.
- Automatic gain and frequency control.
- Audio Equaliser.
- Range of operating temperature -5 to 45 degree centigrade and 95% humidity.

# Carrier Protection

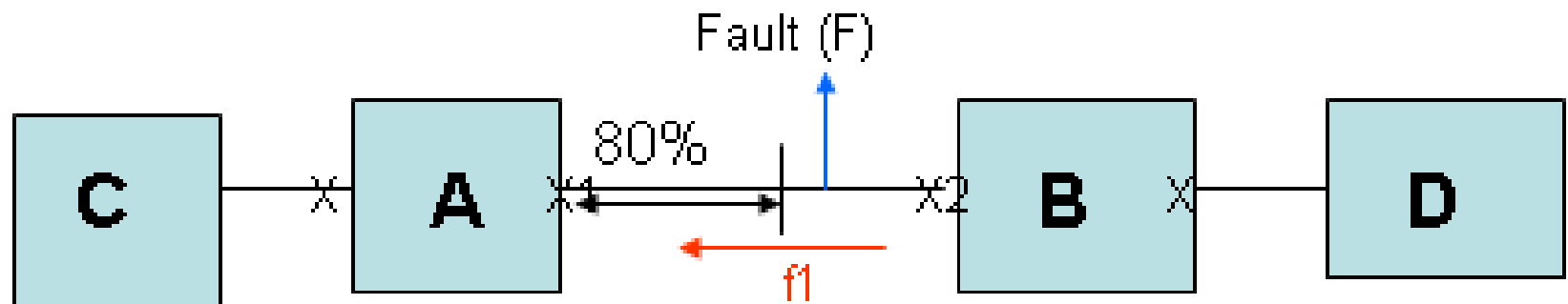
- With the help of carrier frequency ( **30KHz - 500 KHz**) used in Power Line Carrier Communication (PLCC) , **electrical equipment is protected** in the event of a fault on **132KV, 220 KV & 400 KV** transmission line section .
- Carrier protection equipment is installed inside the cabinet containing PLCC equipment .
- The receiver in carrier protection equipment of the stations continuously monitors the pilot and gives alarm when strength of pilot signal falls down in the event of fault (**say earth fault / phase fault or both**) .The stations say A & B connected with faulty line section will trip the faulty line through protection relay.

# Carrier Protection scheme on 132KV line section.



Blocking signal  $f1$ ,  $f2$  &  $f3$  prevent the tripping of remote end breakers  $X1$ ,  $X2$  &  $X3$  respectively .

# Carrier Protection scheme on 220KV /400KV line section.



For a fault(phase/earth or both) at location F , inter-tripping signal **f1** will trip the remote end breaker X1 of station A

# Carrier-aided Distant Protection

## Blocking Type

(132KV line) *[except radial feeder]*

Tele protection signal traverses through the healthy section of the transmission line.

It suffers less attenuation.

More reliable.

Processing: slow

## Inter-tripping Type

(220 KV/400 KV line)

Tele protection signal traverses through the faulty section of the transmission line & suffers more attenuation.

Direct

(with starter)

• Very fast

Permissive

(no starter)

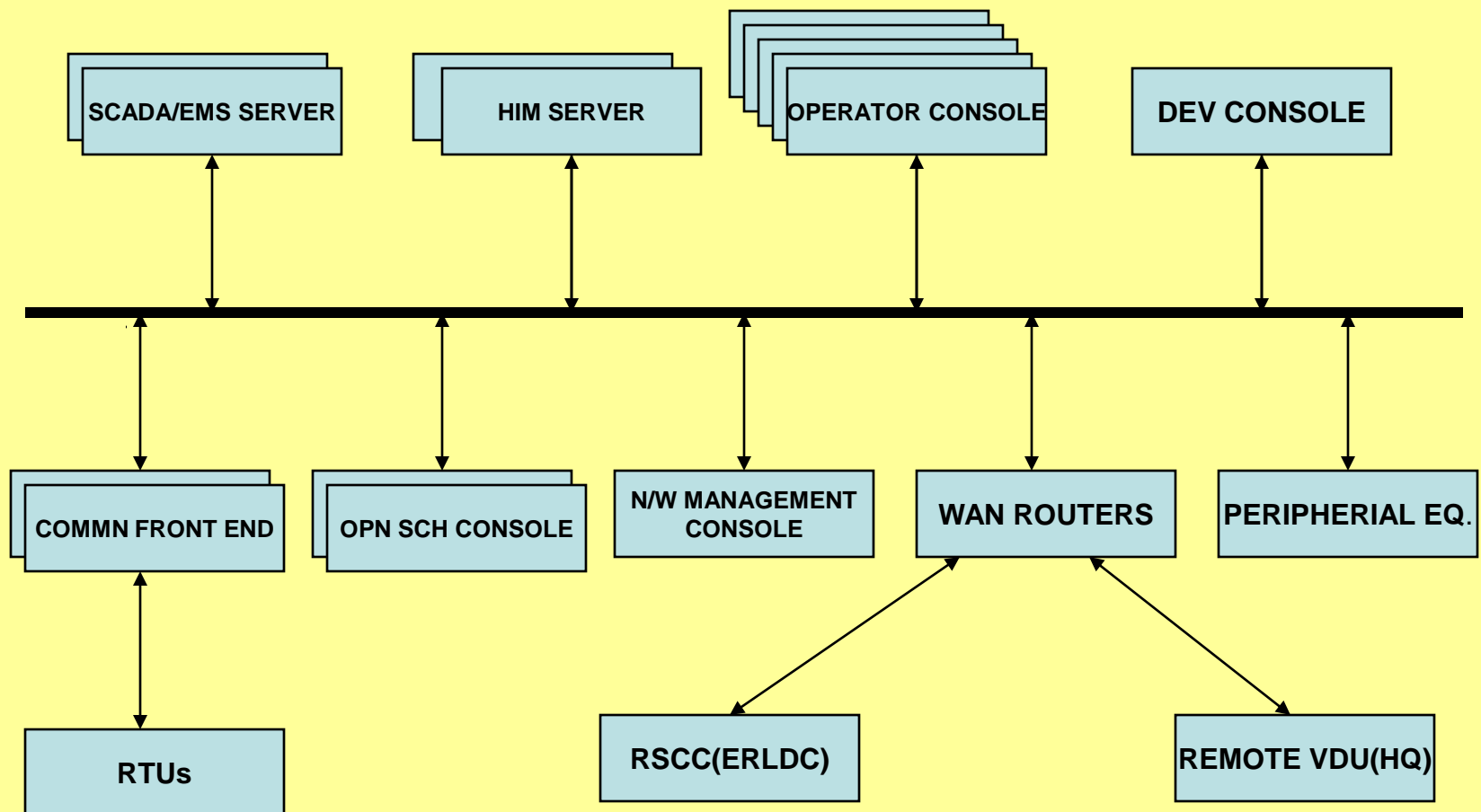
• Slower



# EMS/SCADA(ULDC) SYSTEM

- Transmission EMS/SCADA implemented under ULDC scheme through PGCIL.
- Complete solution of Energy Management system.
- State of the art technology.
- Real time monitoring of power system analog parameters and status.
- Monitored all the generating stations and important 132KV , 220KV & 400 KV sub-stations.
- In total 26 nos RTU locations, 01 no SLDC at Maithon and 01 no monitoring centre at DVC HQ, Kolkata.
- Wide band microwave link were established for reliable data transmission and put in commercial operation since Sept'2005

# SLDC-MAITHON H/W Architecture



# SCADA (Supervisory Control & Data Acquisition System)

- Processes: Analog
  - » Status
  - » Accumulators
- Value Replacements
- Calculations
- Limit Checking
- Historical Data Recording(HDR).
- Intersite Data
- Topology Processing
- Tagging
- Controls
- Load Shedding

# NETWORK SCADA

- Topology Processing
- State Estimation
- Bus Load Forecasting
- Short Circuit Analysis
- Contingency Analysis
- Security Enhancement
- Voltage/ VAR dispatch
- Optimal Power Flow

# GENERATION SCADA

- AGC
- Economic Dispatch
- Reserve Monitor
- Transaction Scheduling
- Load Forecasting
- Operation Planning
- Study Generation

# MICROWAVE NETWORK

- Broad Band Communication Backbone
- Reliable & high Speed Network
- Provides Voice and Data Communication
- State of the art Technology
- ALCATEL make PDH, MUX & other Equipment
- Covers All Power Stations, Central Load Despatch & HQ
- Used Space Diversity architecture.
- Deployed Network Management System

# VERY HIGH FREQUENCY (VHF)

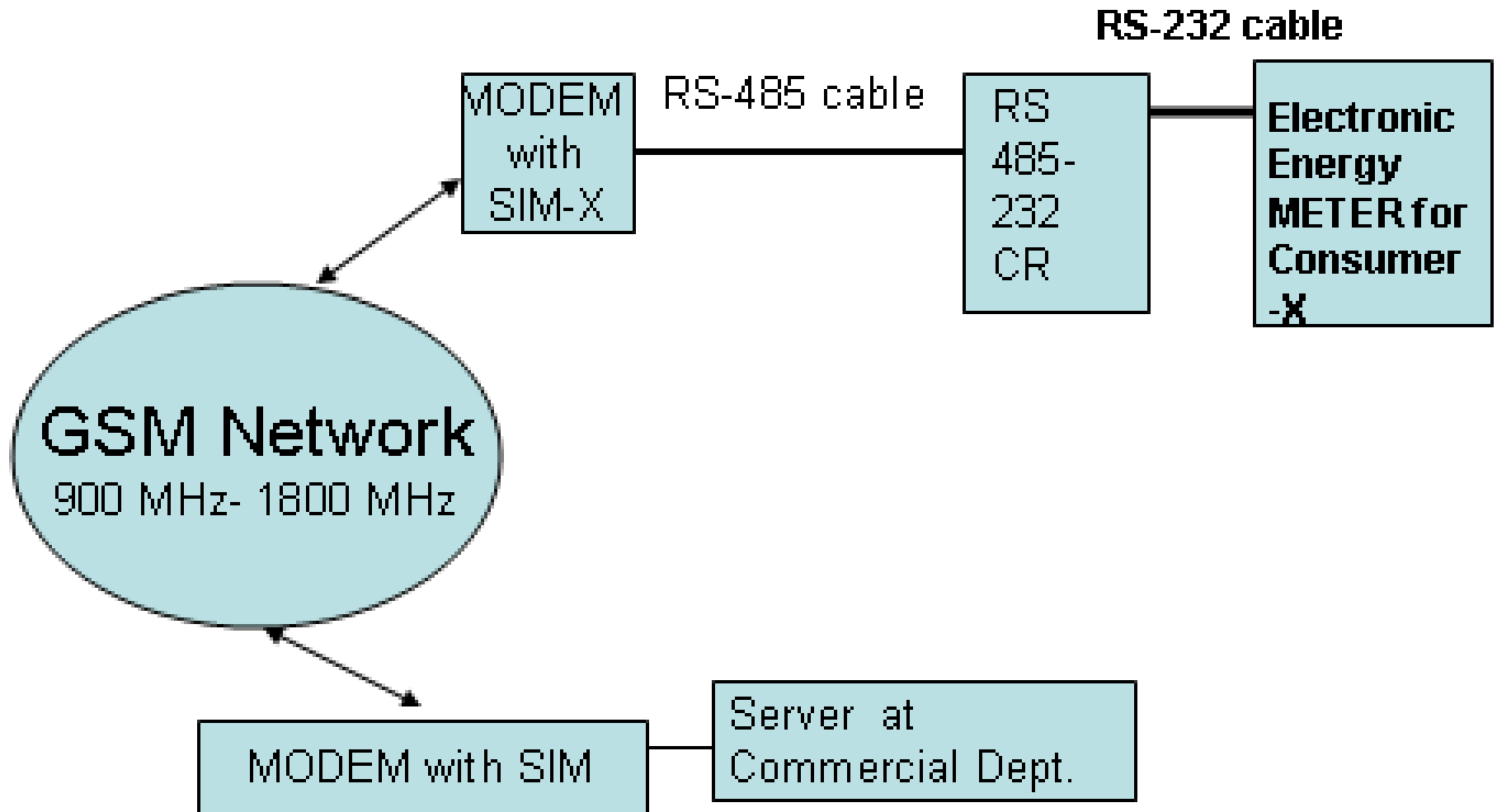
- At present 121 VHF Stations including recent additions viz. 132 KV Ray (ER) & North Karanpura sub-stations are operational throughout the valley.
- Objective is voice communication in between sub-stations & receiving stations and also consumer premises.
- During monsoon additional VHF Stations are set up at selected river heads to monitor river flow and reservoir data .

# Technical data for VHF Co System.

- The frequencies as allotted to WPC Wing ,DOT to operate V  
146.175 M Hz. , 146.225 M Hz  
146.325 M Hz. , 146.375 M Hz
- Mode of commn. : Simplex – T  
Line of sight



# GSM Metering



# GSM Metering

- GSM (**Global System for Mobile communication**) is being used in DVC for remote telemetering system both in West Bengal & Jharkhand .
- More than 200 consumers of DVC are under GSM network
- **Data enabled SIM** card is inserted in **MODEM (ECD 100)** .
- The electronic **ENERGY meter** is connected with MODEM via **RS-232** cable.
- Dial up GSM data enabled system .
- Tariff metering data is received from the meter at consumer's premises to the server at Commercial Department , DVC Hq., Kolkata .
- Power supply bill can be raised within scheduled time from Commercial Department ,DVC for **SMS feature** of GSM.

# ECD 100 GSM MODEM

- Dual band EGSM 900 M Hz. /1800 M Hz.
- O/P Power : 2W @900 M Hz. &  
1W @1800 M Hz.
- Baud rate : 300 bps to 115200 bps
- GSM data : (a). CSD asynchronous non  
transparent upto 9.6 Kbps.  
(b). HSCSD (2 + 1) upto 28.8 Kbps.
- TCP / IP protocol through RS-232 commn.media

# GSM SIM

- SIM interface : **3 Volt**
- Data enabled : Outgoing as well as incoming
- Speed : Minimum **1200 bps**
- Connection : Circuit switched data
- Data format : **8 data base** , no parity & 1 stop bit.

# Electronic Private Automatic Branch Exchange (EPABX)

EPABX system is based on **PCM TDM** technology.

Totally **unblocking** open architecture .

“**Stored program control**” is used for the following features :

- a). Centralised maintenance and automatic fault diagnosis .
- b). To reduce the time spent on dialing & dialing errors.
- c). Interactive human –machine interface .
- d). Facility to record number calls .
- e). Electronic billing system .
- f). EPABX can be connected to PSTN or other telecom network via Analog / Digital / wireless trunk .

# IP enabled EPABX system

- Modern EPABX systems are IP enabled , ISDN compatible & can be controlled by **centralized server** and connected with other network through **GATEWAY**.
- Some of the special features of the IP enabled EPABX systems are :
  - (i). Duplication of the server (hardware redundancy)
  - (ii). Disaster Management feature with auto recovery .
  - (iii). Voice announcement with auto-attending facility .
  - (iv). Unified Messaging System( Voice mail, FAX mail ).

# Replacement of Microwave link of DVC by Optical fiber cable

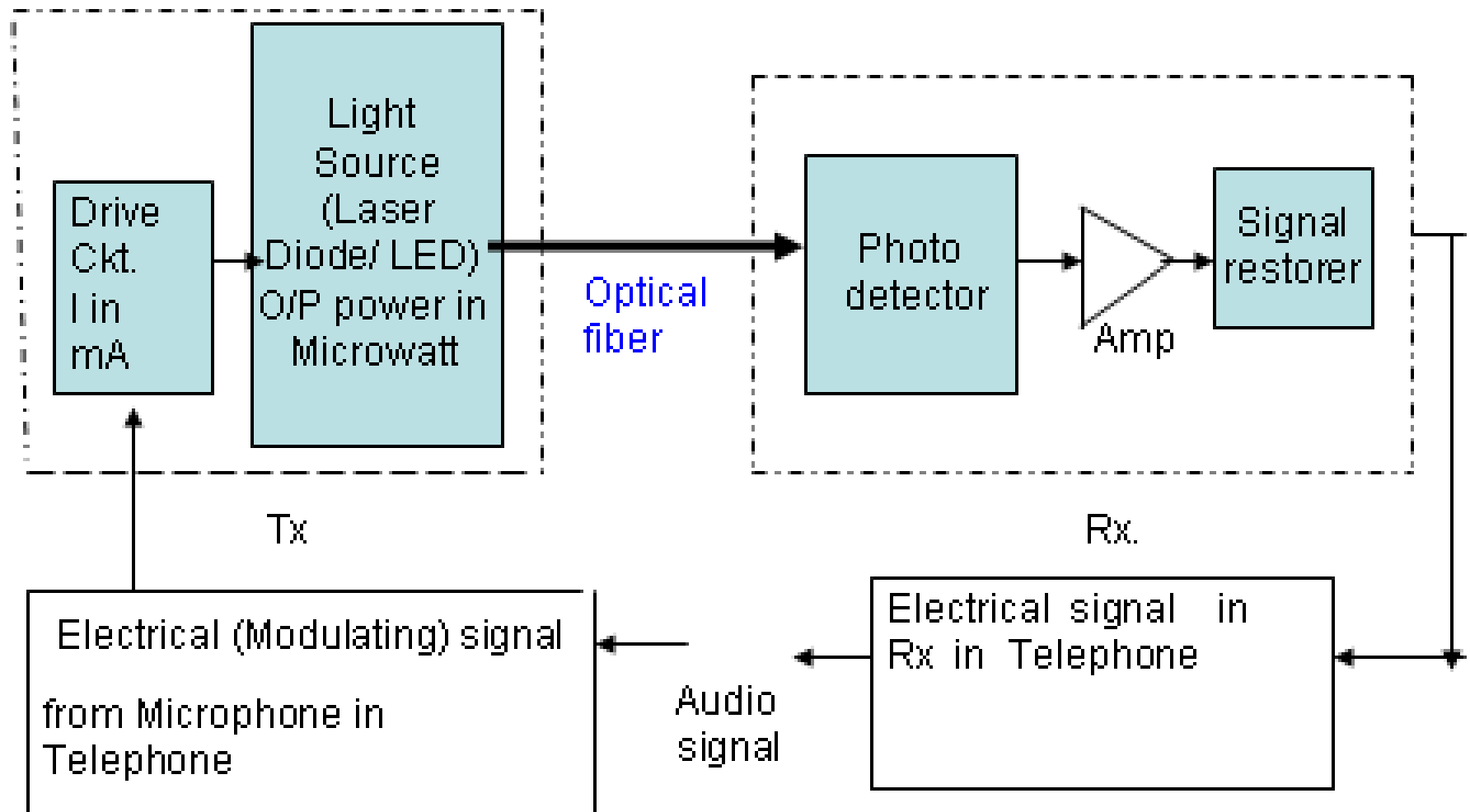
To vacate the existing microwave link (2.3 G Hz -2.4 G Hz) as advised by WPC, it is required to lay Optical fiber cable .

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graph TD; A[ ] --- B[Overhead cable  
OPGW (Optical  
Ground Wire)]; A --- C[Under Ground Cable  
UGFO (Under Ground  
Fiber Optics)];
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Overhead cable  
OPGW (Optical  
Ground Wire)

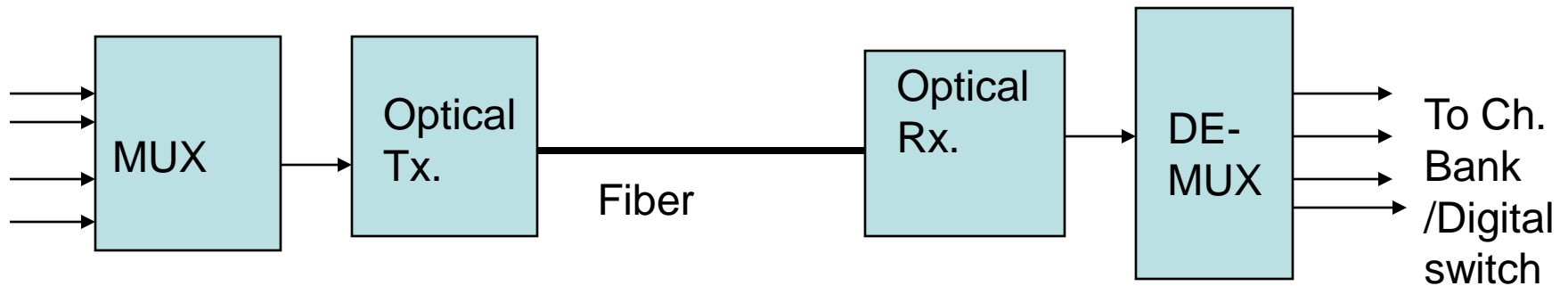
Under Ground Cable  
UGFO (Under Ground  
Fiber Optics)

# Optical fiber based commn. link





# Fiber Optic Trunk Carrier facility



From  
Ch.  
Bank  
/Digital  
Switch

# Advantages of using optical fiber cable over copper wire

- Wavelength : Infrared region of the spectrum,  
850 nm/ 1300 nm/ 1550 nm
- **Band width is higher**
- Data rate : 100 Mbps to 2 Gbps
- Fiber is not affected by power surges ,  
**electromagnetic interferences** or power failures .
- Excellent **security & Low attenuation** . : Fibers do not leak light and it is quite difficult to tap .
- Channel : **Half duplex** (light signal can move only in one direction at a time through the fiber using **total internal reflection property** of light .
- Lighter in weight

# Replacement of Microwave link of DVC by OPGW (Optical Ground Wire) /UGFO (Under Ground Fiber Optics)

- The microwave link between **DVC HQ** and **ERLDC , Kolkata** has been replaced by leased line by Powergrid .
- (b). The subject work is going on at **MTPS , Kalyaneshwari S/S.**, Maithon Hydel Power Stn. (**MHPS**) , **Maithon SLDC** , **DTPS (Waria)** , **Parulia (DVC)**, **Parulia (PG)**, **CTPS-A** to **Bokaro-B** ( via **CTPS-B** ).

# Future OPGW Networking project utilising DVC tr. system

- PGCIL has also assured DVC to take up the future OPGW / UGFO project in subsequent phases covering almost the entire DVC Transmission Grid ( **132KV/220KV**) network as well as connecting new & upcoming Power Stations and substations for voice & data commn.
- integration with SLDC , ERLDC & DVC HQ. matching with the upgradation / replacement programme of ULDC SCADA system..
- Expected date of complete switching over to new system is **before December 2014.**

# MPLS-VPN

- To control and monitor the input data as available from the respective remote server under Distributed Control System (DCS) of six generating stations namely **MTPS-Ph-I (2X250 MW)**, **MTPS- Ph-II (2X500 MW)** , **CTPS-B (2X250 MW)** , **DSTPS (2X500 MW)** , **RTPS (2X600 MW)** and **KTPS (2X500 MW)** by DVC Hq., Multi Protocol Label Switching –Virtual Private Network will be established .
- It will be implemented through router .

# VIDEO CONFERENCING

- To save **cost** for arranging a meeting, to save **time** for attending a meeting, the technology “Video-Conferencing” has been introduced in DVC.
- Video-Conferencing is conducted between two or more participants at different sites by using networking devices and protocols to transmit & receive digital audio & video data.
- Generally each participant has a **video camera**, **microphone** and equipment (**VDU**) to transform analog signals into digital bit stream for traversal across a **LAN** or **WAN**.
- The **QOS** will depend upon the following features;
  - **Band Width** of the system (i.e. Data handling capacity)
  - **Latency** (i.e. network delay. Should be within **10-20**msec)
  - **Routing** ( i.e. the easiest path the participating nodes in the network)