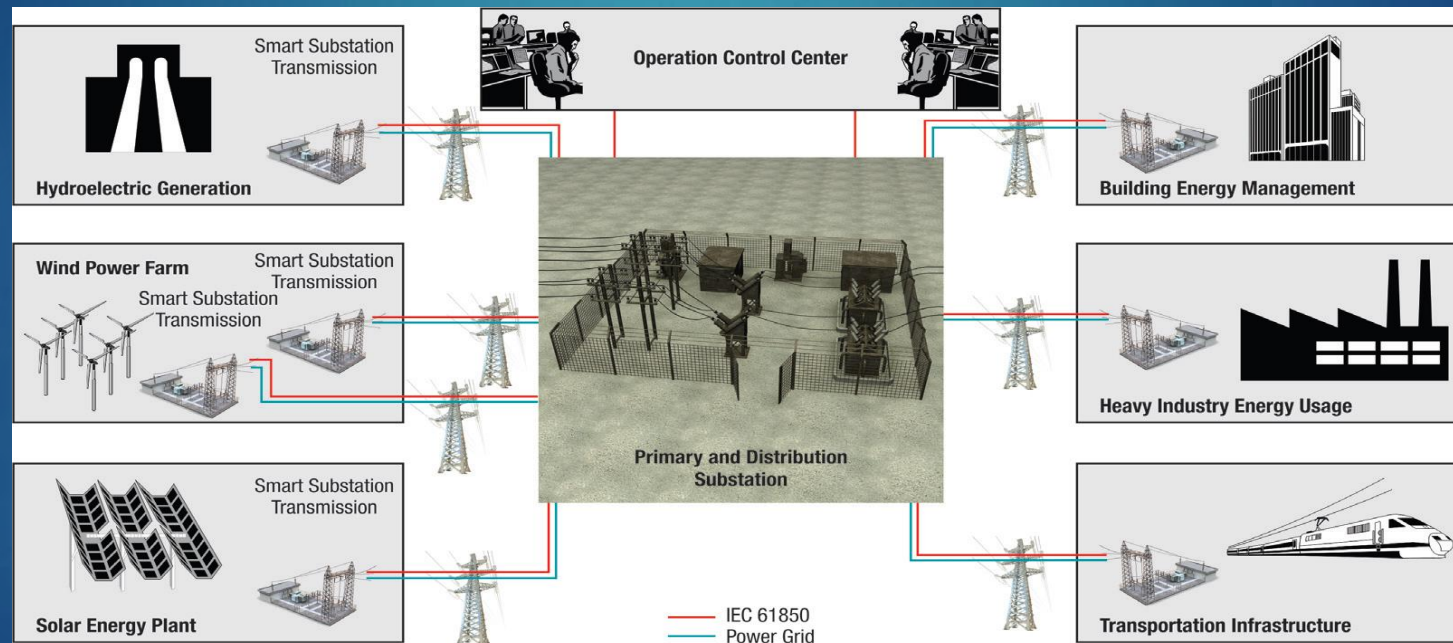


IOT SOLUTION FOR GRID-X (Grid management system)

GMS(Grid management system)

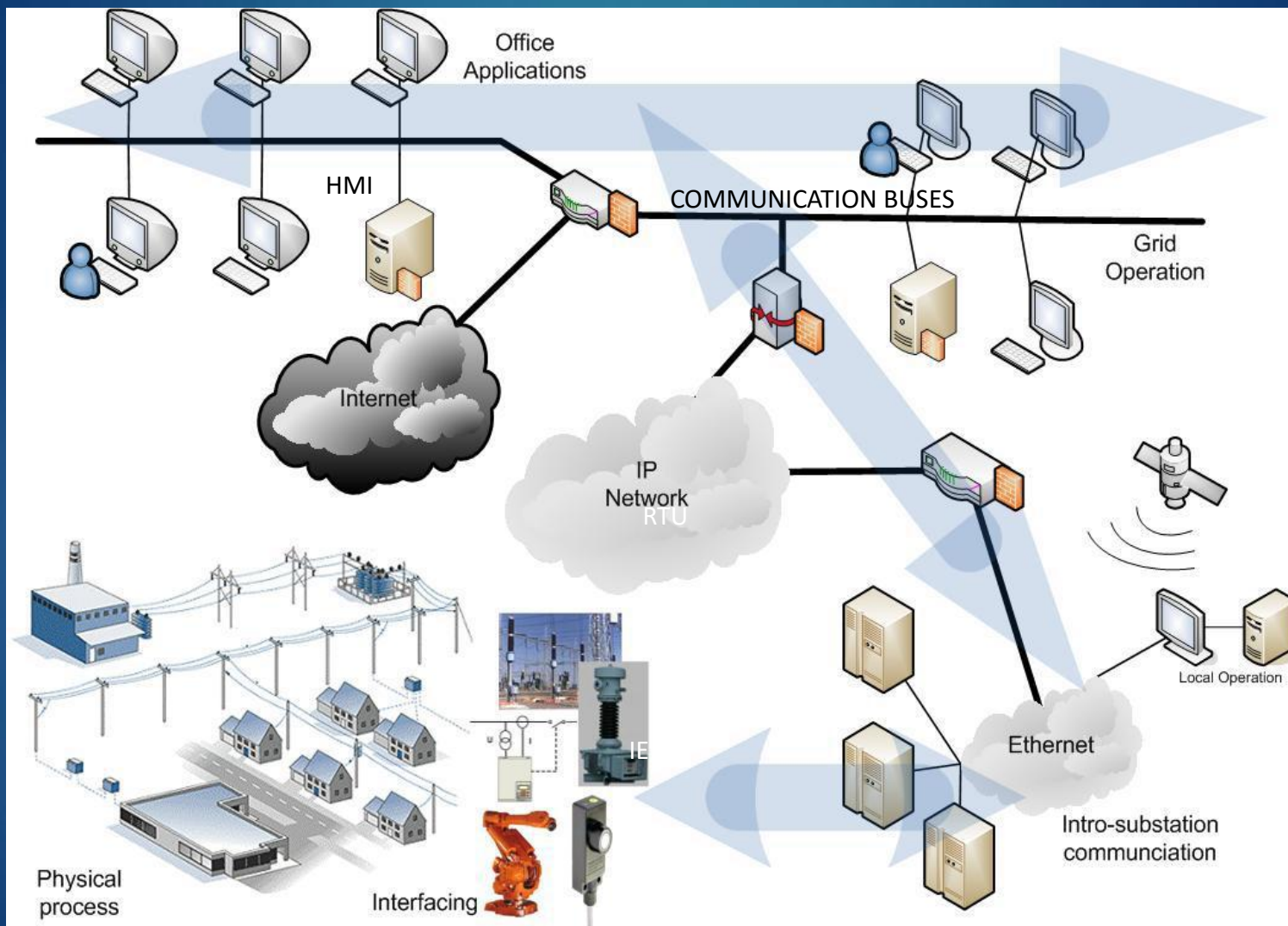
- Smart Grid for Distribution & Transmission
- Multi-service Field Network for metering and grid automation.
- Secure operation WAN for substations to meet regulations.
- Pass audits and prepare grid for two-way power flows.



GRID X- Our solution for GMS

The grid topology needs to adapt and shift from a centralized source to a distributed topology that can absorb different energy sources in a dynamic way. There is a need to track real time energy consumption and demand to the energy supply for that we are employing our solution GRID X.

- Deployment of more remote sensing equipment capable of measuring monitoring and communicating energy data that can be used to implement a self-healing grid.
- Integrating new modern tools and technologies for transmission and distribution.
- Incorporate extensive capacity, rapid, centralized communications superior diagnostics, and feedback control that rapidly return the system to a stable state after interruption or instability.
- The level of self-monitoring and decision making.



Common components

- **Remote Terminal Unit**

- Telemetry and remote control device

- **Intelligent Electronic Device(s)**

- Device that implements functions in a substation, such as a protection relay

- **Bay controller**

- A device that controls all devices related to a single bay (transformer, feeder) and communicates with relays for functionality

- **Human Machine Interface (HMI)**

- Typically an industrial PC with operator console for local control and system configuration

- **Communication bus(es)**

- Connection between devices

- **Upwards communication interface.**

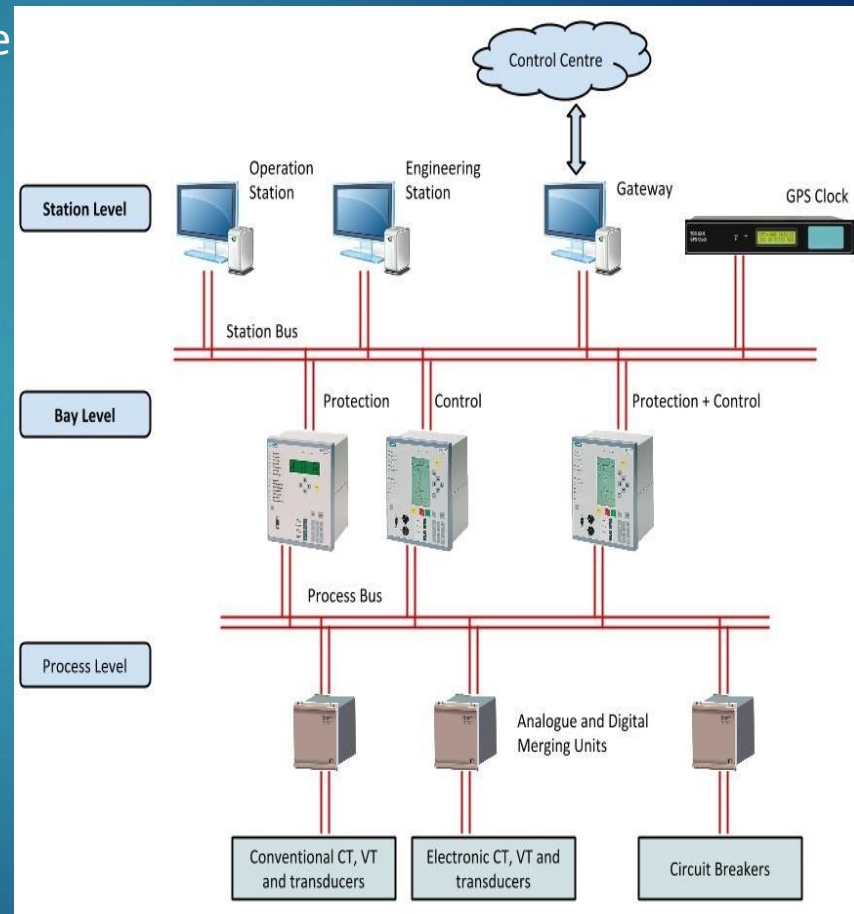
- Implemented in the HMI, the Bay controller or in an IED.

Modern substation architecture

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- Sampled values for current and voltage
- I/O for protection and control
- Control signals
- Engineering and configuration
- Monitoring and supervision
- Control Center communication
- Time synchronization

- **CT= Current Transformer**
- **VT= Voltage Transformer**



Need for Sensors for the Smart Grids

- Sensors will be a key enabler for the smart grid to reach its potential. The idea behind the "smart" grid is that the grid will respond to real-time demand; in order to do this, it will require sensors to provide this "real-time" information.
- The current grid is dominated by a system that is mostly electromechanical in nature, radial in its layout with centralized generating capacity and one way in its communication with little or no sensor feedback to centralized decision makers.
- The transition to a digital network with two-way communication, a network topology with distributed generation, grid storage and pervasive control systems and self monitoring presents extremely attractive opportunities for sensor firms.

Smart meters and sensors used

A smart meter is the key component of the Smart Grid that enables utility companies and consumers to better monitor, conserve, and control their energy usage. They are designed to enable two-way communication from a home/business to the utility, providing interval energy consumption data and time-of-day pricing information to end-users.

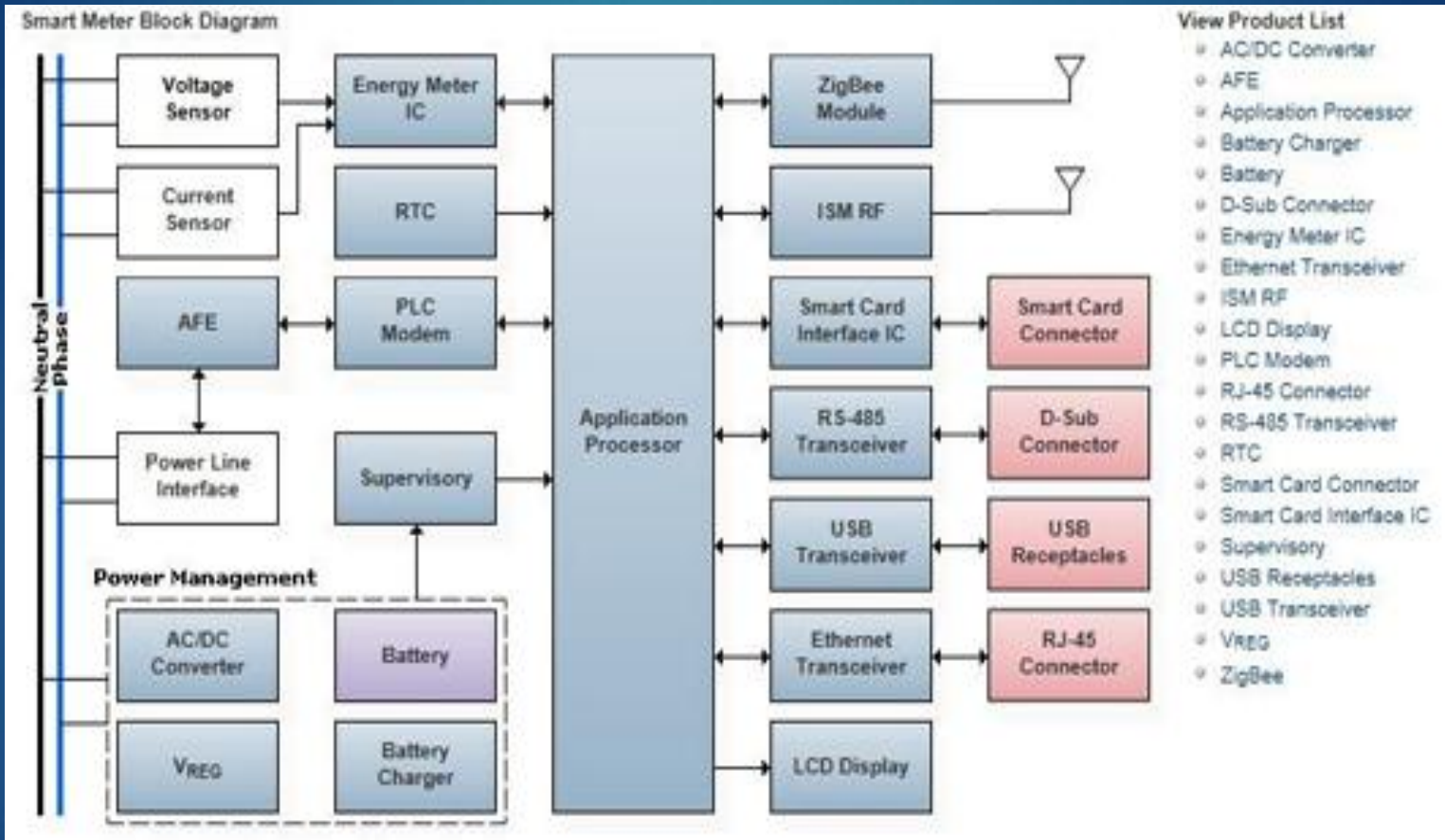
SENSORS USED:-

- **Current sensor**
- **Voltage sensor**
- **Accelerometers**
- **Hall sensors**
- **Anisotropic magneto resistance (AMR) sensors** :- used to implement a hidden switch to alternate between the operation display mode and the maintenance display mode
- **Thermistors**:- For temperature sensing and over current protection of the PCB
- **Piezoelectric shock sensor**:- For tamper detection

SMART METER BLOCK DIAGRAM

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Sensors used in Transformers

The current sensors

These available in two versions: Divisible cable type current transformers used especially for retrofitting existing switchgear, and closed ring cores mounted on the outside-cone bushing of the switchgear in a single- or three-phase version.

Voltage sensors

The voltage sensors are resistor dividers which provide an output signal of $3.25 \text{ V}/\sqrt{3}$ at the rated primary voltage. The voltage sensors are available as cast resin plugs, which are inserted into the cable T-plugs instead of the blind plugs.

Temperature sensor for oil-filled transformers

APPLICATIONS

- **Power transformer temperature monitoring**
 - Core
 - Windings
 - Bushings
- **Load Tap Changer temperature monitoring**
 - Contacts
 - Oil
- **High voltage testing**
- **Generators**
- **Transmission lines**
- **High voltage cables**
- **Switchgears**

Monitored parameters by sensors in transformers

- **Load, Voltage**
- **Temperatures:**
 - Top oil and Bottom oil
 - Ambient
 - (Hot Spot with Fiber Optic)
- **Gas in oil: Composed gas**
 - Multi-gas (DGA)
- **Moisture**
 - Bushing Tan Delta and Capacitance
- **OLTC(on load tap changer):**
 - Position, Temperature, Contact wear

Sensors used for Grid management

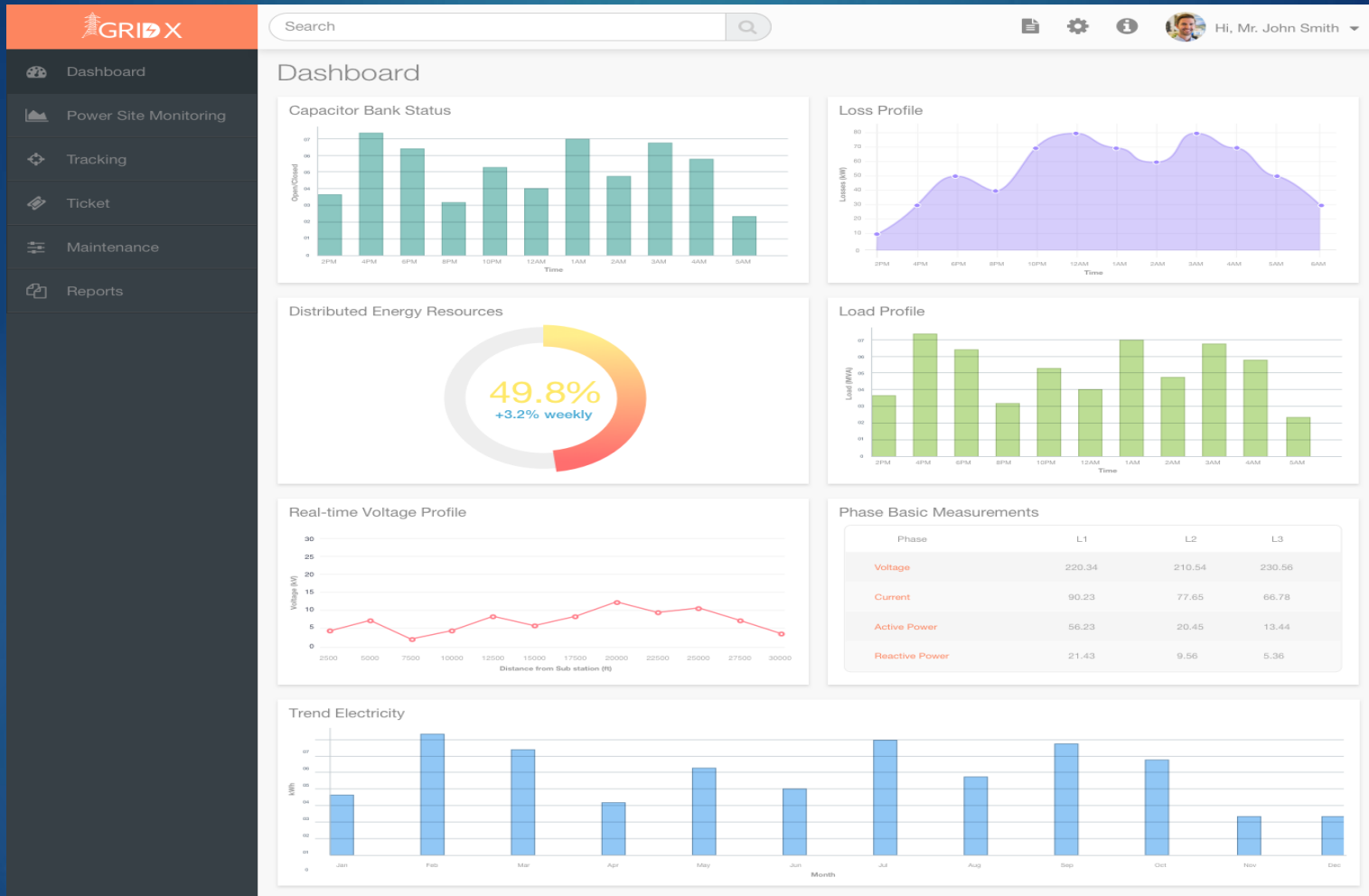
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- Basic measurements :voltage sensing, current sensing, temperature sensing, moisture sensing, continuity sensing and phase measurements.
- Wireless Sensor Networks for Automated Meter Infrastructure (AMI)
- Smart Voltage Sensors
- Smart Capacitor Control ,that can monitor and control capacitor banks remotely
- Smart Sensors for Outage Detection.
- Smart Sensors for Transformer Monitoring.
- High Voltage Line Temperature and Weather Condition Sensors.
- Distributed Generation Sensors for load balancing
- Smart Grid Storage and in load monitoring and dispatch of energy .

Unified site dashboards of GRID-X

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Power site monitoring

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- Dashboard
- Power Site Monitoring
- Tracking
- Ticket
- Maintenance
- Reports

Hi, Mr. John Smith

Power Site Monitoring

BILL13

Site ID: BIL100010	District: AURANGABAD	Cluster: AURANGABAD	Zone: Rohtas	Circle: MH	Current Source UNKNOWN	Technician Ram Prasad 9886665544
Type: GBT	Height: 1000	Address: MR.VIKAS KUMAR SINHA, S/O MR.SURESH PRASAD LAL, B...			Site Mode AUTO	Cluster Engineer Shwetha 9886667788

Alarm Status
Transformers
Meters
Sub-stations
Power
Tenants
Remote Command

Transformers

- ☐ Oil Leaks
- ☐ Bushing Oil Level
- ☐ Oil Level in OLTC
- ☐ Silica Gel in Breather
- ☐ Gas Analysis
- ☒ Sonic Fault Detection
- ☐ Ultrasonic Partial Discharge
- ☐ Damage/Cracked Bushings
- ☐ Loose Terminals
- ☐ Diverted Contacts
- ☒ WTI & Tap Position
- ☐ OLTC Surge Relay
- ☐ Trip Contacts

Circuit Breakers

- ☐ Gas/Air Leakage
- ☐ Air Pressure
- ☐ Hotspots
- ☐ Oil Leaks
- ☒ V-belt Tension
- ☐ Cracking Insulators
- ☒ Lamp ON/OFF
- ☐ Due Point Measurements
- ☐ DCRM

Current Transformers

- ☐ Bellow Expansion
- ☐ Oil Leakage
- ☒ N2 Pressure Checking
- ☐ Corona Effects
- ☐ Capacitance
- ☐ CT Ratio Test
- ☐ DGA
- ☐ Magnetisation

Potential Transformers / CVT / CC

- ☐ Bellow Expansion
- ☐ Oil Leakage
- ☒ Earthing HF Point
- ☐ Corona Effects
- ☒ CVT Capacitance
- ☐ Voltage Measurement
- ☐ EMU Tank Oil Testing

Disconnectors & Earth Switches

- ☐ Cracks in Insulators
- ☐ Tension Bearings
- ☐ MOM Box & Earth Switch
- ☒ Earthing Blades
- ☐ Stopper Bolts
- ☒ Auxillary Switch Contacts
- ☐ Corona Balls & Rings
- ☐ Main Contact Resistance

Surge Arresters

- ☐ Pited or Black End Exhaust Parts
- ☐ Crack in Insulators
- ☒ Counter Testing
- ☐ Leakage Current Meters
- ☐ Earth Connections

Wave Traps

- ☐ Main Coil Integrity
- ☐ Bird Gaurd
- ☒ Thermo Vision Scanning
- ☐ HF Line Trap
- ☐ Blocking Impedence

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GRID X

Dashboard

Power Site Monitoring

Tracking

Ticket

Maintenance

Reports

Search

Hi, Mr. John Smith

Power Site Monitoring

BILL13

Site ID:
BIL100010

District:
AURANGABAD

Type:
GBT

Cluster:
AURANGABAD

Height:
1000

Zone:
Rohtas

Address:
MR.VIKAS KUMAR SINHA, S/O MR.SURESH PRASAD LAL, B...

Circle:
MH

Current Source
UNKNOWN

Site Mode
AUTO

Technician
Ram Prasad
9988665544

Cluster Engineer
Shwetha
8068667788

Alarms Status

Transformers

Meters


Sub-stations

Power


Tenants

Remote Command

Current Power in from Grid

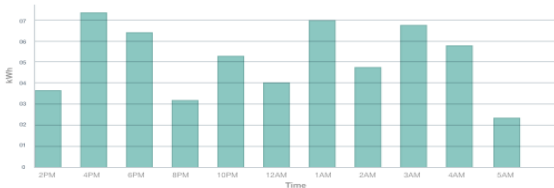


Current Power Out to Grid

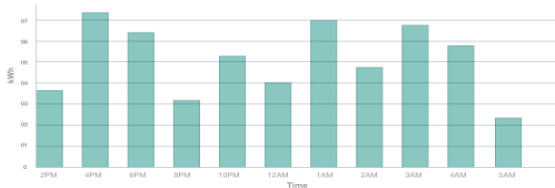


Meter Readings

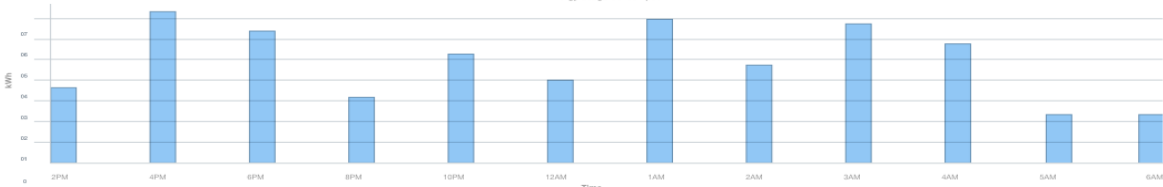
Power in from grid meter readings



Power out from grid meter readings



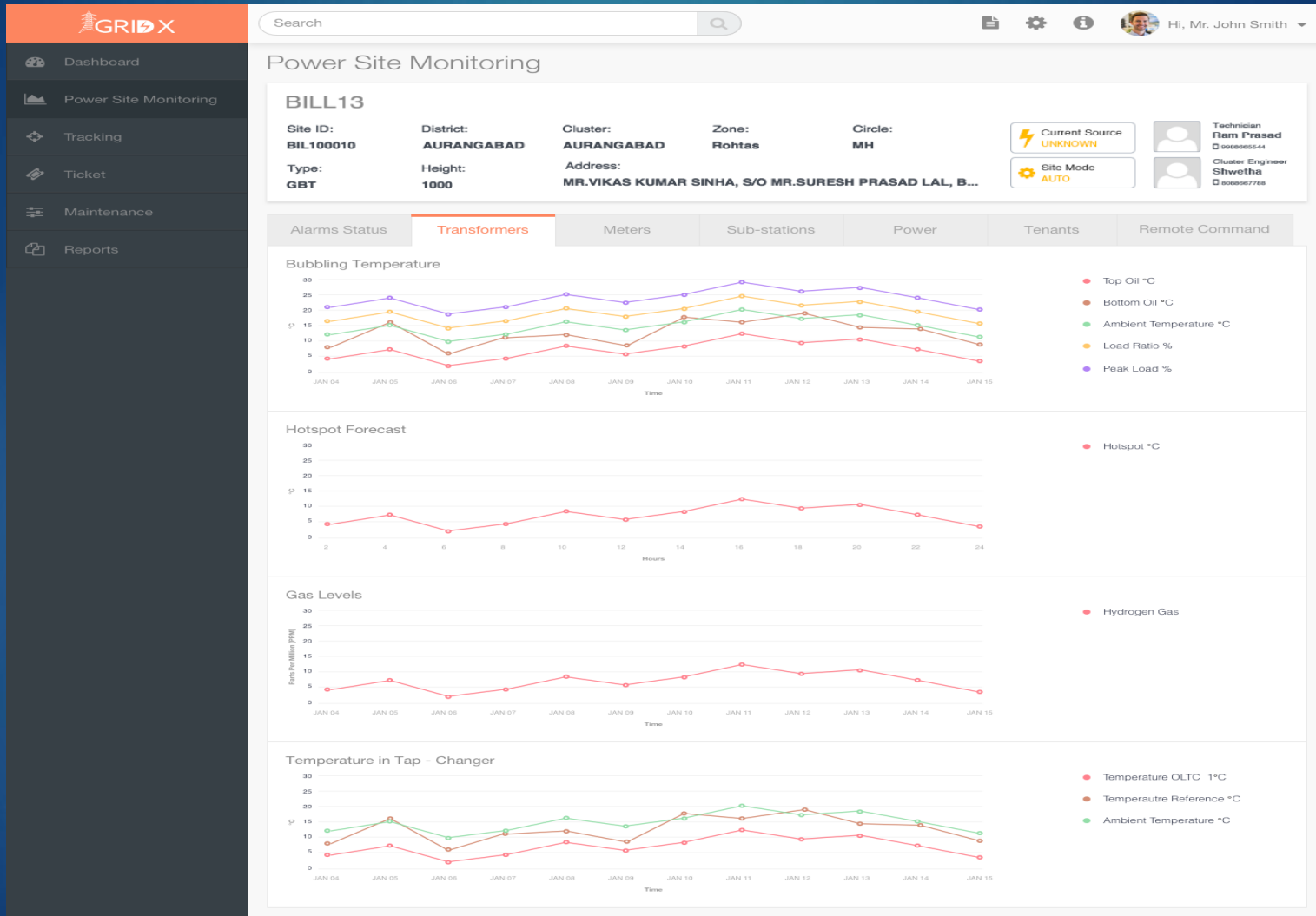
Energy Usage Consumption



Transformers

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Smart power grid solution- Grid-x

1. Grid-x is uniting diverse monitoring, communications, intelligence and action technologies into information-age solutions which allow for new operations and customer-side applications of the electric grid.
2. Our smart grid technologies are also helping reduce the price of electricity through more reliable communication between consumers and suppliers. We're also using the smart grid to enhance operation, make more efficient use of grid assets, and help plan more cost-effective expansion of the electric grid.
3. All these systems and experiences are now combined into a comprehensive vision for a unified system architecture that covers many critical Smart Grid requirements.

THANK YOU