



**Grid Thermal Remote Monitor  
(GTRM)**  
**Automated Substation Thermal Analysis tool**  
*automation at its excellence.....*

# Overview

This presentation is about a automated grid facility monitoring system, which will prevent the shut-down, breakdown and faults in any power distribution and management system. These disasters can happen any time without any prior intimation irrespective of severity of the incidence like Diwali, Id, Ramzan, Christmas etc.

Such breakdowns initialize with abnormal temperature rise. Temperature is core factor which denote the condition of transmission lines & other electrical arrangements.

Thermal Imaging Camera from FLIR is being widely used by most of the utility sector units to detect temperature of all type of electrical arrangements. Thermal Imager will inform the entire thermal data of live electric structure as it can be used from a safe distance.

Proposed solution is Grid Thermal Remote Monitor (GTRM) – GTRM is based on Thermal Imaging technique & will intimate the operator about the expected fault which is likely to happen in next span of time.

## GTRM Requirement

- Thermal Imaging Camera from FLIR is an indispensable tool used in almost every Engineering segment across the nation to detect hot spot.
- In existing system utility Engineers visit the Grid/ Substation at periodic interval with Thermal Imager & scan it for any temperature abnormality.
- The engineer deputed for thermal scanning, analyses complete substation efficiently & track hotspots (if any) for preventive maintenance purpose.
- After preventive maintenance by the maintenance staff, grid ensures trouble free continuous operation.
- Every thing goes well when above mentioned tasks are performed, but **What if.....**

# GTRM Requirement

## What if.....

- ✓ Fault can occur anytime, between two maintenance schedule, leaving the system paralyzed.
- ✓ Scanning schedule skipped
- ✓ Scanning engineer missed hotspot
- ✓ Scanning engineer unable to report properly to the maintenance staff for hot spots

## **GTRM Requirement**

### **Solution ?**

**Scanning engineer & maintenance staff should be 100% efficient & should not opt for any mistake/ negligence**

**But it seems to be impossible, as human error can be minimized but can't be nullify**

**Hence, in order to ensure trouble free grid operation , fully automated yet convenient system is required.**

**The solution is.....**

**[Grid Thermal Remote Monitor](#)**

## **GTRM Technology**

*GTRM uses field proven excellence of Thermal Imaging Camera from FLIR Systems integrated with the Remote monitoring software customized specifically as per application/ requirement.*

**FLIR Systems – Global leading manufacturer of Thermal Imaging Camera from past half a century with excellent field experience around the globe including INDIA .**

**PCI Limited – Specialized in providing FLIR’s thermal imaging solutions. Also involved in providing high quality technical solutions & vast industrial/ R&D product range. Dedicated R & D shell with hi-tech team of software & hardware engineers for providing customized solutions & consultancy related to Power Electrical & Embedded Electronics engineering to our customers.**

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## **GTRM Technology**

**GTRM incorporates high end Automation series Thermal Imaging Camera from FLIR. Thermal Imager is a fixed type camera specifically designed for 24 x 7 continuous monitoring of application.**

**Camera is incorporated with IP66 enclosure and Pan & Tilt mechanism in order to monitor vast grid area with least no. of cameras.**

**A hardware set will be installed in substation for data transmission to control room. Complete set of hardware will be installed in control room as per requirement.**

**Fully customized software will be installed on both the nodes to perform required monitoring.**

**Data transmitted from substations can be controlled & monitored by grid officials in the control room.**

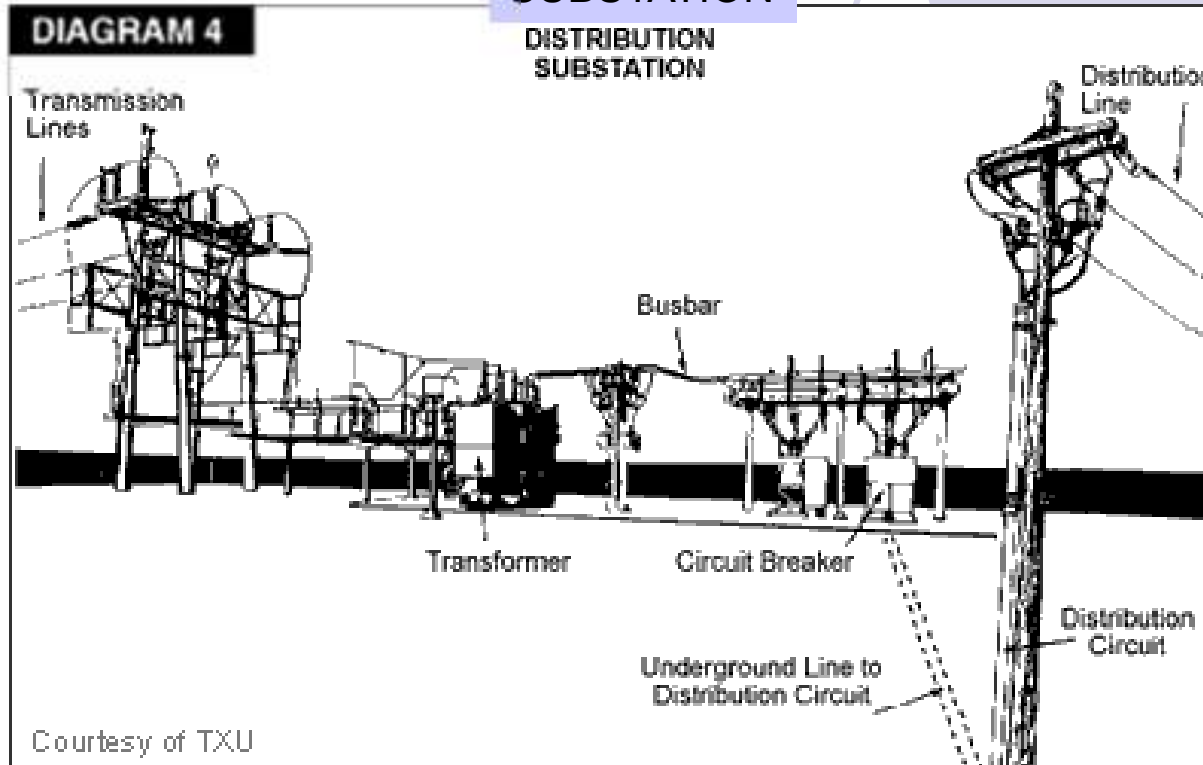
# Grid Thermal Remote Monitor



Both Cameras are mounted on high grade PAN & Tilt arrangement with panning @ 360° & Tilting @ +40° -90°

Cameras installed on MAST at appropriate location to cover maximum area  
Thermal Imager – 1 no.  
Visual Camera – 1 no. as option

## SUBSTATION



3 or 4 set-up to be installed based on size & criticality of substation



# The Product



Micro System Engineers

# Product Components



FLIR A310 F environmental housing with the FLIR A310 Camera inside, used for fixed mount staring installations. 25° is standard and built in, optional lenses 7°, 15°, 45°, and 90° can be ordered. Built on FLIR Nexus Technology.



FLIR A310 PT Pan and Tilt system with two environmental housings. First housing is for the FLIR A310, second housing is for an daylight camera.

The P&T is used in applications where routing and scanning large areas is necessary. Built on FLIR Nexus Technology.



FLIR Sensor Manager client software that handles all the connected Nexus Servers. Also used for Control and Set-up of the system and the A310 built in analyze functions and alarms.

## Options & Accessories



- Computers with FLIR Sensors Manager
- A310 Optional lenses (25-degree standard)
- Network Digital Video Recorder, NDVR
- Wall mounts
- Brackets

# GTRM Working

## Monitor

- Transformers
- Cooling fins
- High Voltage lines
- Circuit breakers
- Switches



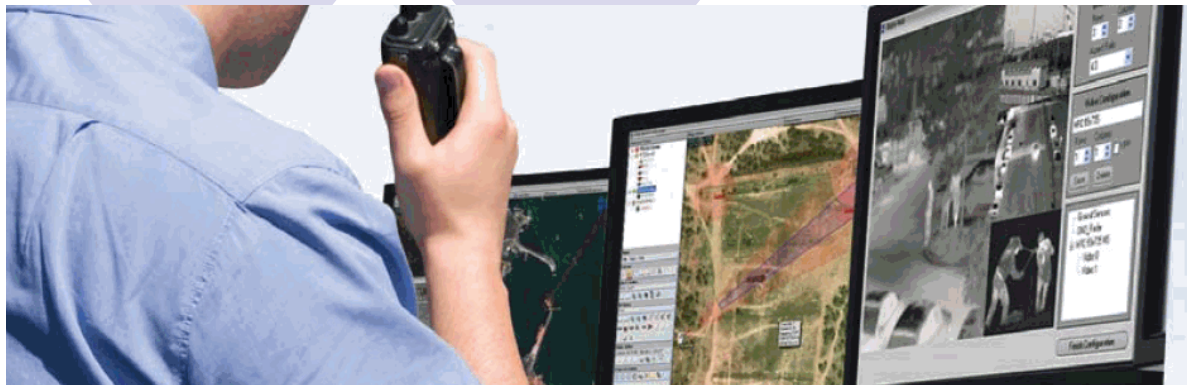
## Detect

- Oxidation problems
- Over heated connectors
- Incorrect secured connectors
- Insulation defects

# GTRM Working

## Flexibility

- Prevent theft
- Protect life
- Protect asset
- See intrusions with live images on TV, PC monitor
- Possible to mix Thermal- and Visual Cameras



# GTRM Working

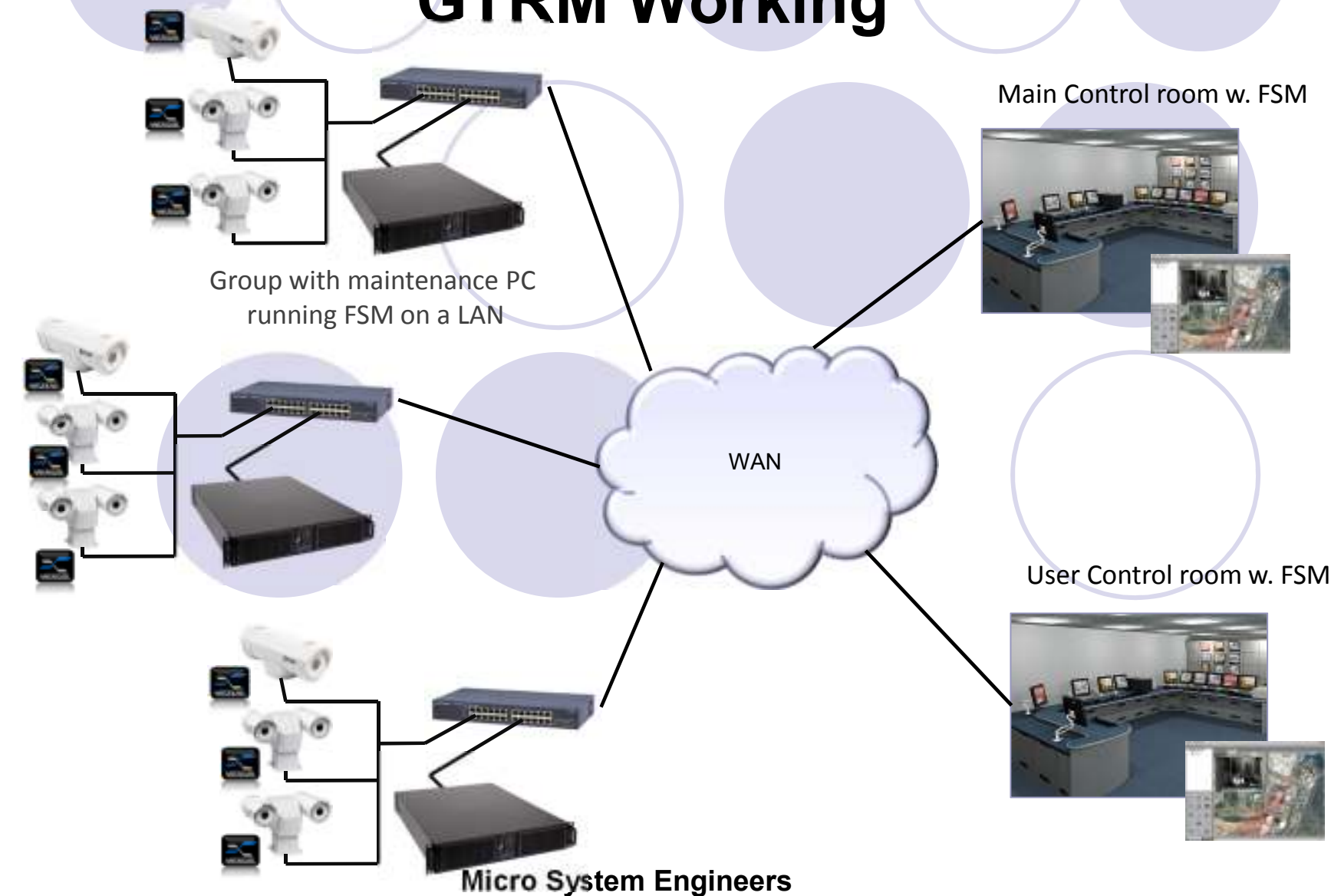
## Efficiency

- Remote monitoring
- Cover large areas of the asset
- Increases up-time without adding personnel
- Improves the reliability of electric power delivery while reducing costs.
- Detect impending equipment failures and security breaches anytime, day or night 24/7





# GTRM Working



# Grid Thermal Remote Monitor



## A310 F



IP control with Power over Ethernet support



Extremely rugged system with IP66 protection



Thermal camera with 320 x 240 resolution



Video streaming, MPEG-4 and Composite video



Built-in analysis functions



Several lenses with FOV from 7° to 90° (option)



Built-in alarm functions



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## Grid Thermal Remote Monitor



# A310PT



Precise Pan/Tilt mechanism with 128 preset positions



Daylight camera with 36x optical zoom (option)



Extremely rugged system with IP66 protection



Thermal camera with 320 x 240 resolution



Built-in analysis functions



Several lenses with FOV from 7° to 90° (option)



Built-in alarm functions



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# FLIR Sensors Manager



Easy of use "out of the box" software



Multi sensor support with license models to support your needs



Support of Nexus technology enables to control a wide variety of sensors



Multi languages support, 11 as of today



Pro and Basic versions to support your needs



## GTRM Working

- *Thermal Imaging Camera will be installed at all the targeted substations at subjective location to cover complete area vide its Pan & Tilt arrangement.*
- *Thermal Imaging Camera will be equipped with lens of appropriate Field of View based on specific location & requirement of sub station.*
- *Camera will collect thermal data of complete substation & transmit same to the control room using hi-tech combination of hardware & software.*
- *A group of sub-stations may be connected with a single control room for control and monitoring.*

## GTRM Working

- *Complete data will be logged for further analyses in control room.*
- *Alarm is popped up automatically as soon as abnormal temperature is encountered by Thermal Imager*
- *Audible & Visual alarms will be extended in substations/ control room*
- *Alarms can also be reported vide e-mail/ SMS to concern officials*

**GTRM Ensures Automatic Thermal  
*monitoring of complete sub-station***

# Visual vs Thermal Images



Max. temperature detected is 34 deg. C & hence normal





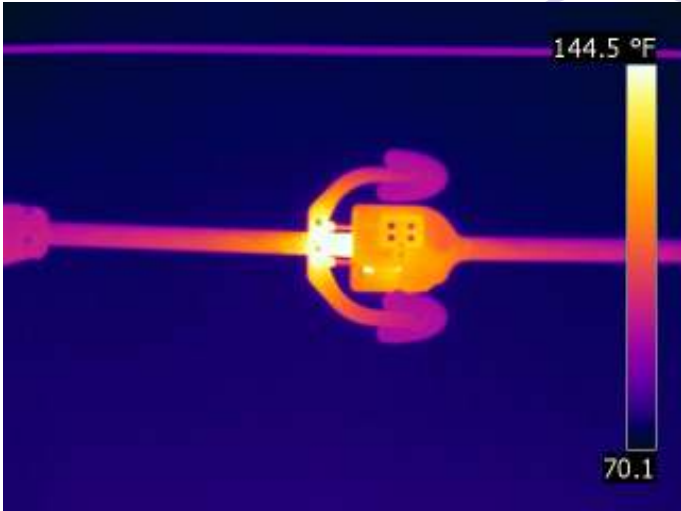
# Visual vs Thermal Images



**Max. temperature detected is 35.9 deg. C & hence normal**



# Visual vs Thermal Images



**Max. temperature detected is 144.5 deg. & hence very abnormal with immediate action suggested**

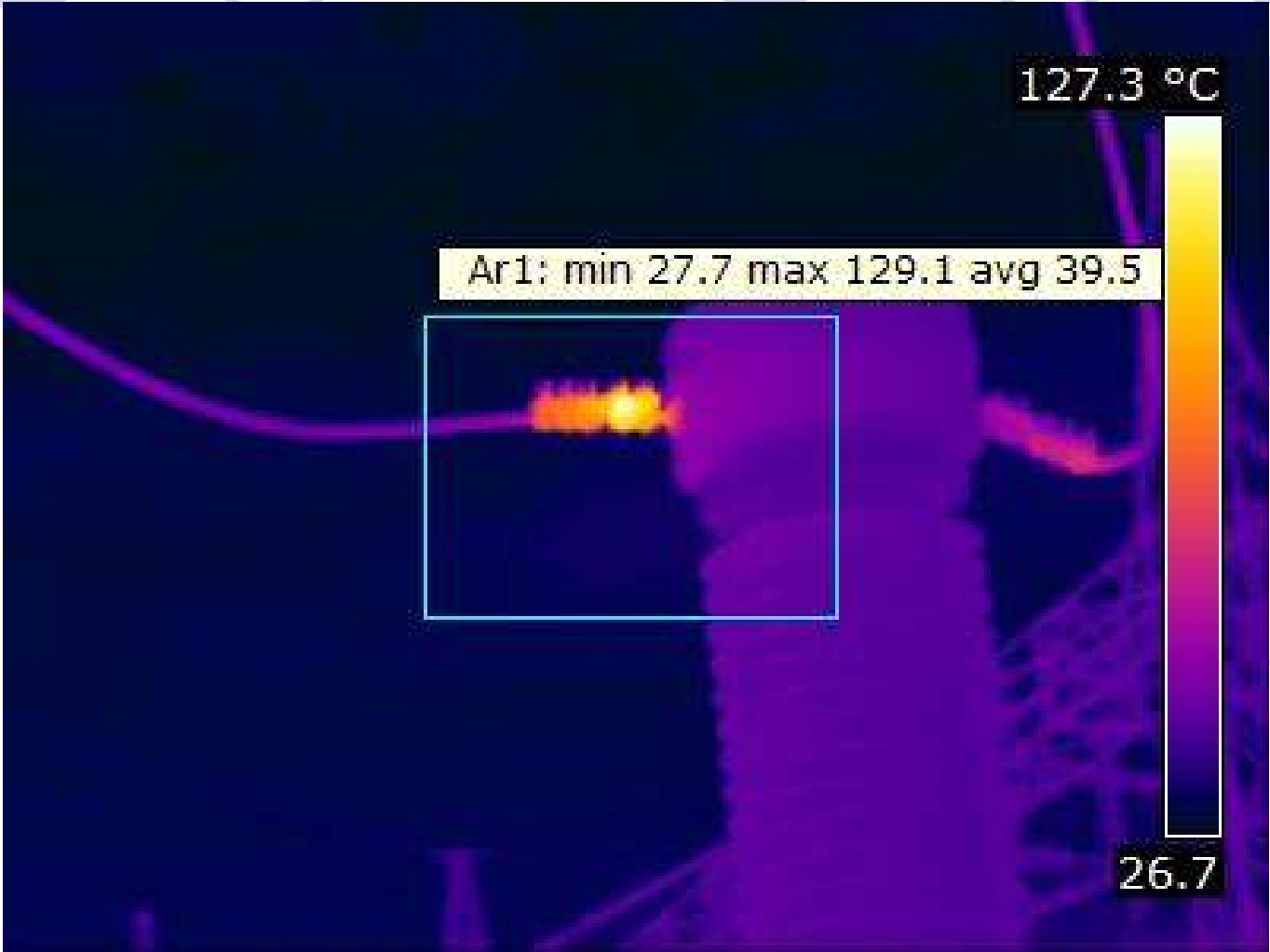




# Fault detected



# Fault detected



# Fault detected



# GTRM

(Attention to fault ensured)

*Fault once detected automatically by Thermal Imager will raise numerous alerts as follows & ensures proper action:*

- ❖ *Audio & Visual alarm in Sub-station/ grid*
- ❖ *Audio & Visual Alarm in control room*
- ❖ *Alert SMS to authorized officers*
- ❖ *Alert e-mail to authorized officers*

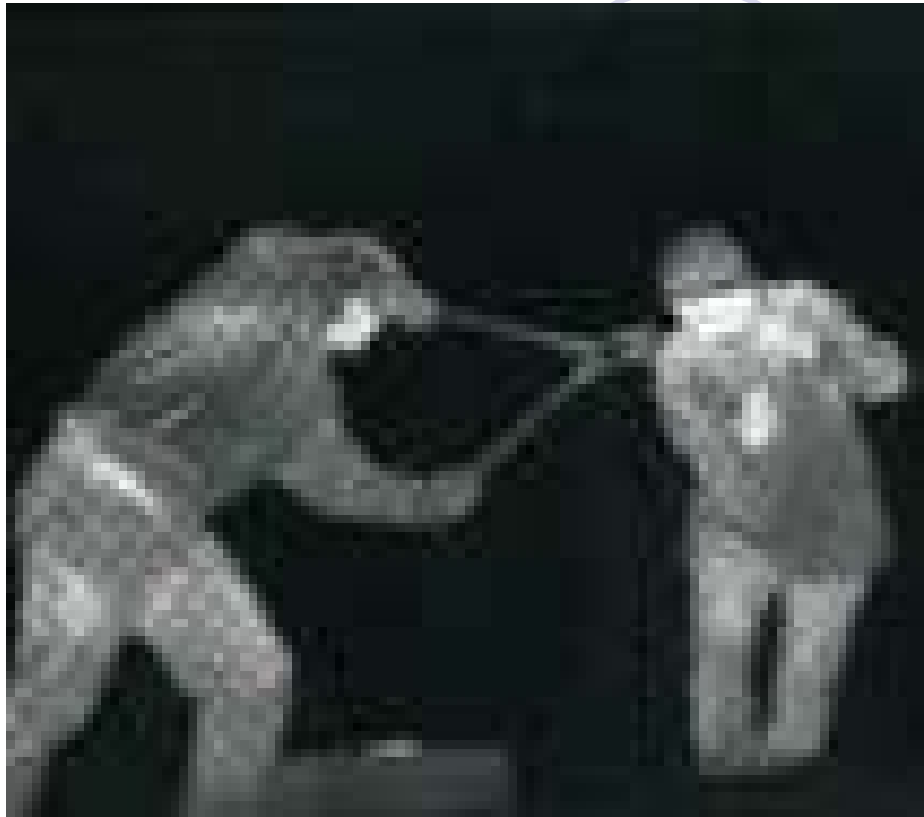
***GTRM Ensures 24 x 7 security/*  
*surveillance of substation perimeter***

# Theft in Substation



The signs say "private property," "no trespassing," even "Danger: high voltage." For a thief going after copper wires & other valued assets in substations, signs don't really matter.

## Theft in Substation



*Thermal Imaging Camera notify intruders cutting substation fencing*

Thermal Imaging camera can look out for security purpose in day & night as well. They don't require illumination to detect the object or intruder.

## GTRM Features

- ❖ *24 x 7 automated monitoring of substation electrical arrangement*
- ❖ *Automatic instant trigger of audio/ visual alarm extension in the event of fault*
- ❖ *User selectable temperature threshold limit*
- ❖ *Alarm extension vide e-mail/ SMS to authorized representatives*
- ❖ *Ensured security of Substations as Thermal Camera can detect any intrusion 24 x 7*
- ❖ *Thermal data including live temperature of spot indicates urgency of fault*
- ❖ *Level II password protected access to substation data*
- ❖ *IP66 rated protection for outdoor use, suitable for all type of whether/ environment*



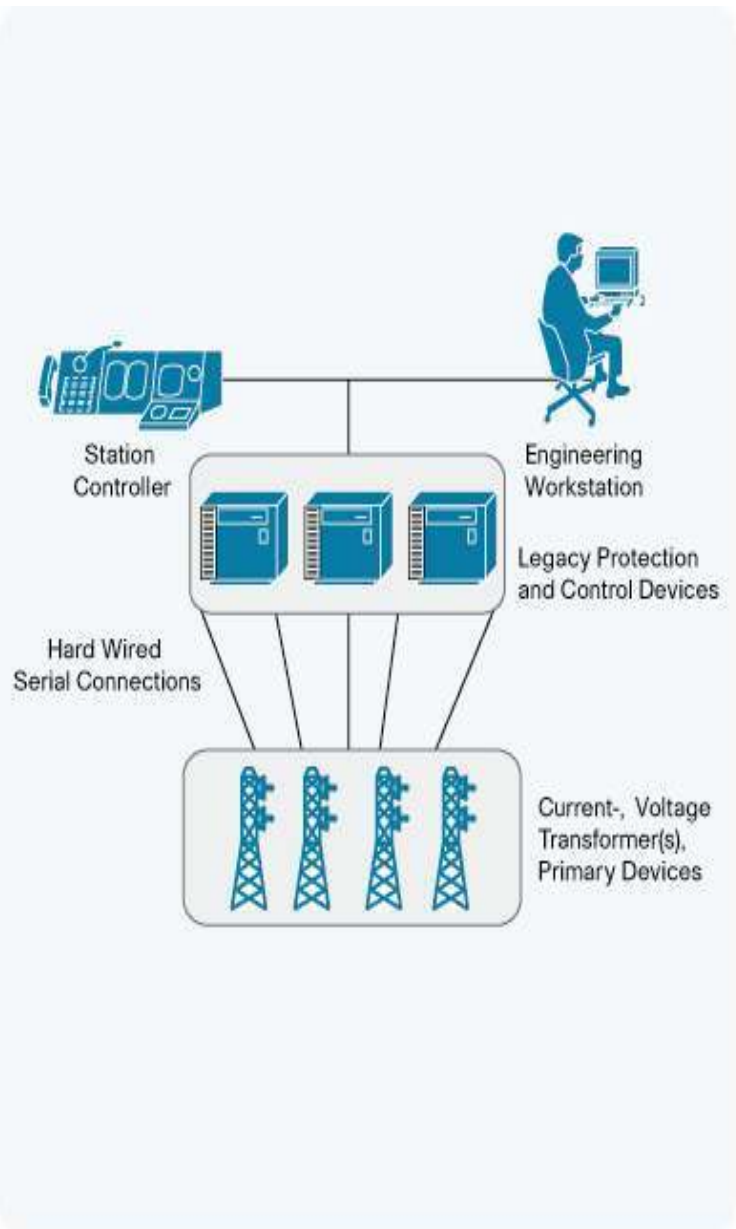
## GTRM Benefits

- ✓ *Absolutely independent & automated topology*
- ✓ *No chances of human error except proper maintenance of substations as per retrieved data*
- ✓ *24 x 7 ensured security without any additional asset & man power*
- ✓ *Results in reduced man power requirement due to automated & continuous scanning*
- ✓ *Instant information on initialization of fault ensures proper time for response from maintenance staff*
- ✓ *Absolute temperature measurement of hot spot indicates level of urgency of fault*
- ✓ *Proper logging of substation data maintained for record & future studies*
- ✓ *Reduced cost in terms of man power for scanning as well as for security*

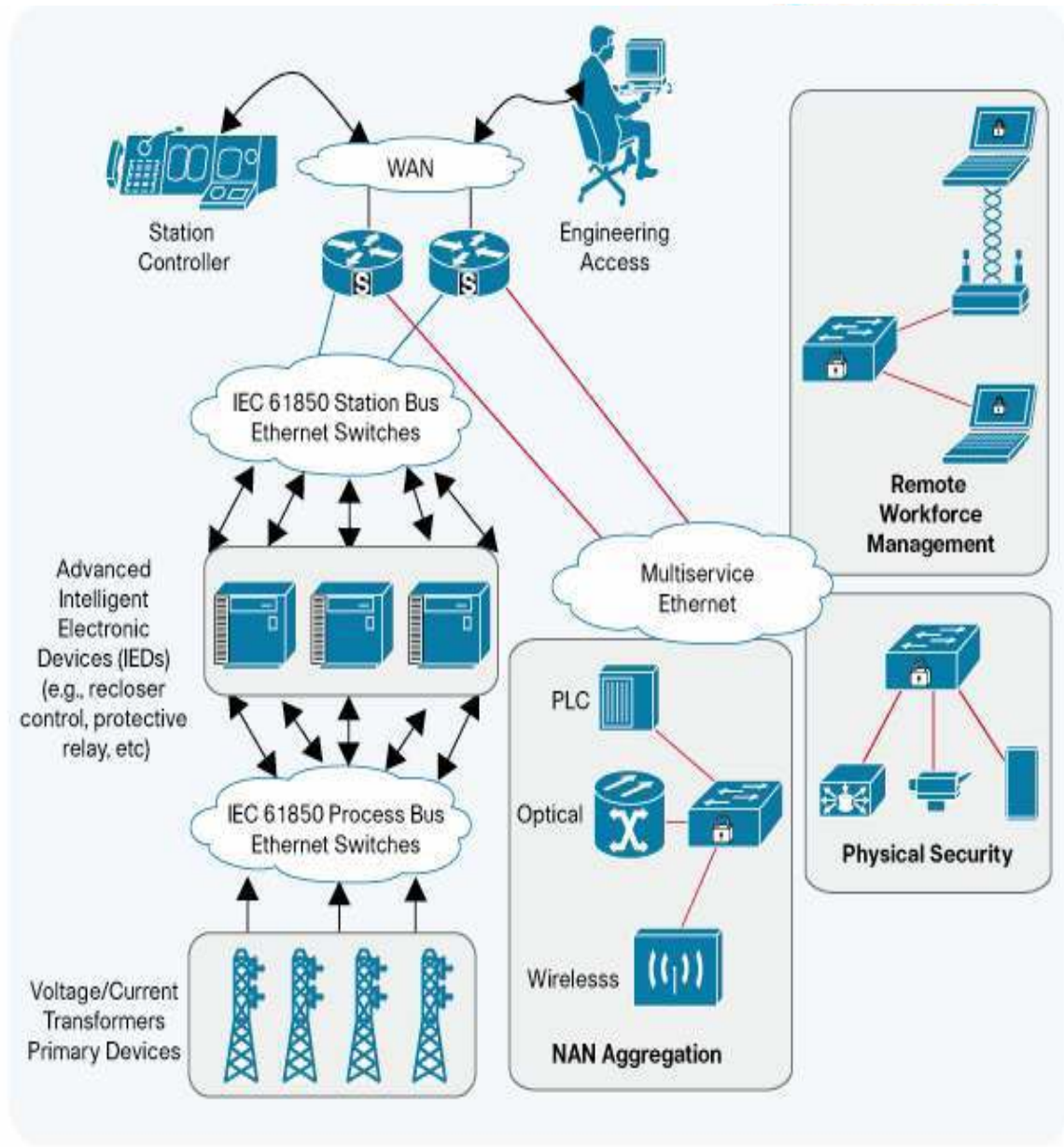
**Grid Thermal Remote Monitor**



**Grid Smart Monitoring Concept**



**Legacy Substation**



**Next Generation Substation**

**Micro System Engineers**



**Thank you**