

Electrical Discharge Inspection Monitoring (EDIM)

April 22, 2026

Welcome, Introduction and Agenda



Introductions



Please invite other interested users from your company

Electrical Discharge Inspection Monitoring (EDIM) Interest Group



Wednesday, April 22nd, 2026
1:00pm – 3:00pm ET



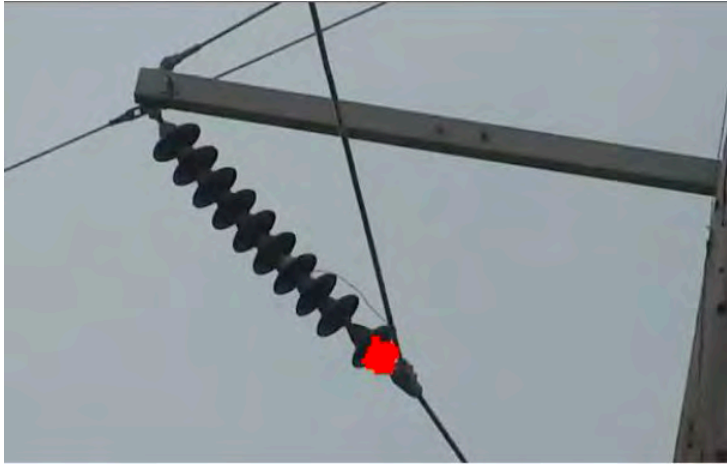
Webex Webcast

APRIL 22 ND , 2026		
TIME	TOPIC	PRESENTER
1:00 p.m. – 1:05 p.m.	Welcome and Introduction	Andrew Phillips, EPRI
1:05 p.m. – 1:40 p.m.	Early Fault Detection	Jon Gonynor, National Grid
1:40 p.m. – 2:15 p.m.	EPRI's Overhead Distribution Grid Monitoring Technology Test Approach	Joe Potvin, EPRI
2:15 p.m. – 2:50 p.m.	Update on Discharge Inspection Training	Andrew Phillips, EPRI
2:30 p.m. – 2:40p.m.	Open Discussion / Q&A Planning for future meeting speakers and topics	All
3:00 p.m.	Adjourn	

Scope

- Share experiences with inspection & monitoring of corona/arcing
- Education on fundamentals of corona/arcing
- Awareness of available EPRI/other resources
- Answer EDIM Members' technical questions.
- Identify research needed
- Awareness technology providers offerings

Corona and Arcing Inspection & Monitoring Technologies



UV Cameras



UV Detectors



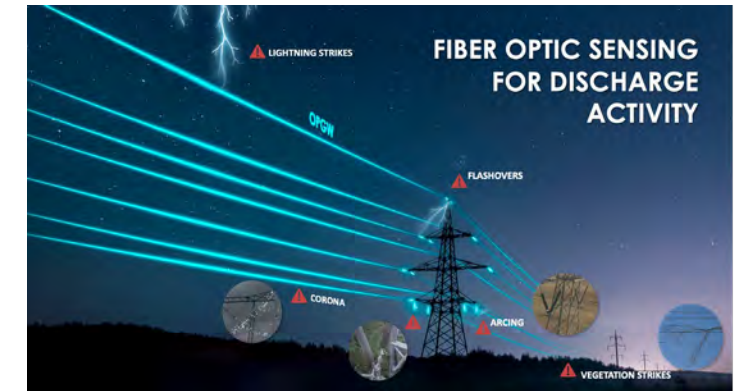
Acoustic Imagers



On-line RF Detection



Portable RF Detectors



On-line Fiber Monitoring

And How They Work Together and Compliment Each Other

Early Fault Detection

EPRI 4/22/26

nationalgrid



Problem Statement & Reasoning Behind Pilot

Current State Challenges

- Typical utility practices for Distribution systems employ a run-to-failure philosophy
- Inspection and maintenance activities are currently largely performed on a time-based and/or condition approach
- Asset failures contribute to reliability and overall grid resilience concerns

Aspiration and Opportunity

- Shift asset management practices from run-to-failure and time-based to a more proactive risk-based approach
- Leverage data and technology to manage assets within acceptable risk profiles
- Build predictive maintenance capabilities for the broader T&D asset base
- Inform new asset strategies for how we design, construct, and maintain infrastructure now and into the future

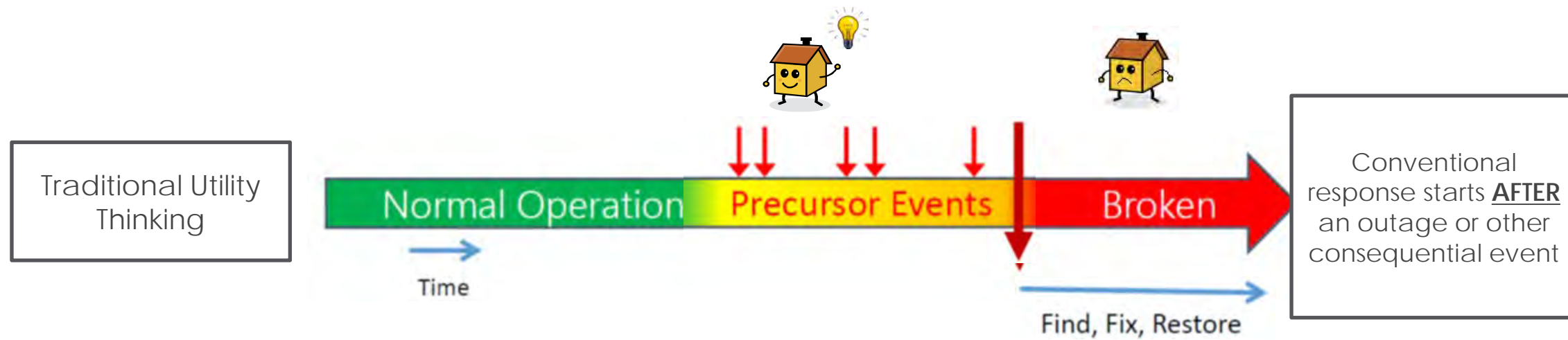
Introduction to Early Fault Detection (EFD)

The overarching purpose of an EFD System is to improve the reliability, resiliency, and safety of the electrical infrastructure it monitors. An EFD System proactively identifies opportunities to prevent outages and customer interruptions, as well as increasing safety of both Company personnel and the general public.

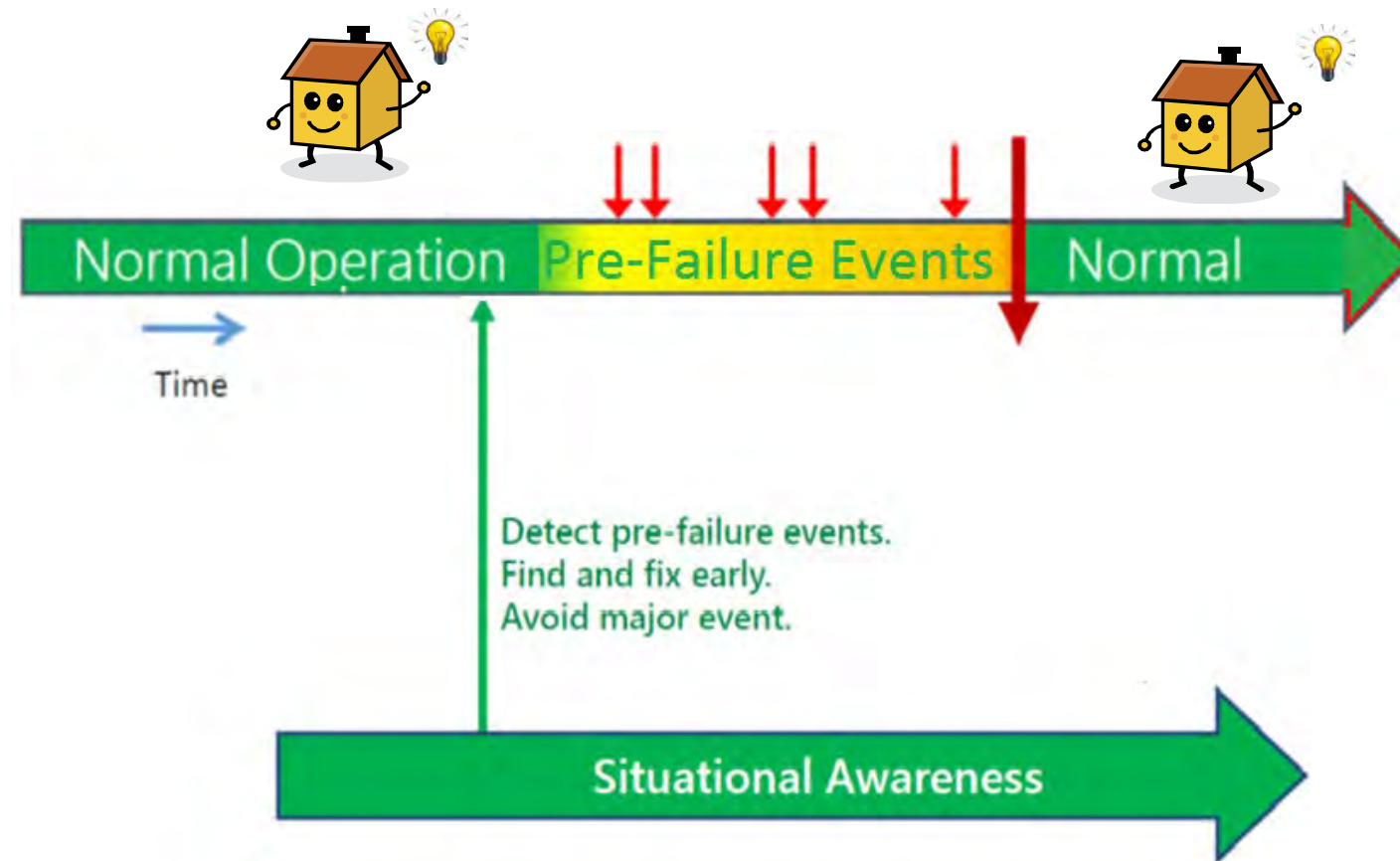
At an operational level, core EFD System functions include:

- Proactive detection of conditions that create risk of failure of an electrical asset.
- Location of each detected condition, typically to +/- 30' of an identified anomaly.
- Provision of data to support remote identification of the type of defect detected.
- Collection of granular system data not traditionally monitored by utilities (e.g. power quality, partial discharge, harmonic content, etc.)
- An EFD System is a passive listening, non-contact, continuous electrical network surveillance system.

Conventional System Maintenance: The Reactive Approach



What If... Modern Maintenance Could Be PROACTIVE?



What is Early Fault Detection?

A system provided by IND Technology which scans each phase for RF signals

When a threat is detected on the circuit, an RF signal is generated; the system records a “detection”

- i.e.: repeated tree contact, failing/broken insulators, damaged conductors etc.

The system looks for trends in RF signal detections, indicating a potential anomaly is present. This generates an “alert”

Alerts are generated before faults occur, power is still flowing

Is voltage agnostic

Works for both T and D

Works for AC and DC

Rated for up to 500kV

Doesn't touch the circuit; all equipment mounted to existing structures

Often can be installed without outage

Can be powered by solar arrays or secondary power

Needs only intermittent cell signal (can be installed in remote locations)



Early Fault Detection Posture

ON THE ONE HAND...

Unplanned Work

Reactive Operational Posture

- *Operations Intensive*
- *Uncontrolled Scheduling / Schedule Churn*
- *Adverse Reliability Impact*
- *Hazardous Work Conditions*
- *Safety Risk to Crews & Public Increased*
- *Inefficient Dispatch without Knowledge of Required Materials*
- *Increased Operations Field Diagnostic Time*

ON THE OTHER HAND...

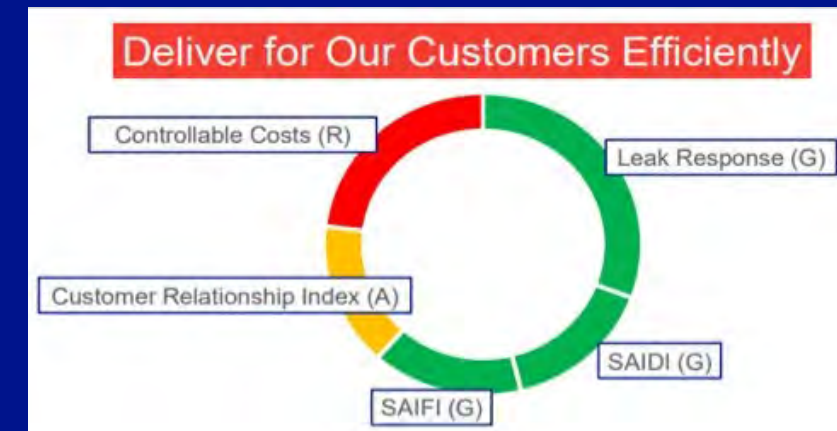
Planned Work

Proactive Operational Posture

- *Improved Efficiency*
- *Controlled Scheduling / Reduced Schedule Churn*
- *Positive Reliability Impact*
- *Increased Safety of Crews & Public Increased*
- *Efficient Dispatch with Proper Required Materials*
- *Decreased Operations Field Diagnostic Time*

Efficiency === Time Saved === Outage Averted ===

Controllable Costs Minimized



Early Fault Detection (EFD) – Event Cause Codes

13 Cause Codes EFD Will Capture w/o Exception	
Cause Code	Event Ranking
Contamination	31
Deterioration	7
Insulation Failure – Cable	8
Insulation Failure – Other	13
Internal Fault	N/A
Tree Growth	9
Moisture	29
Tree – Broken Limb	3
Tree – Broken Limb – Emerald Ash Borer	30
Tree – Vines	10
Improper Installation	24
Device Failed	4
Flying Debris	15

* These Cause Codes Account for 35% of the Total Interruptions Over a 5 Year Period from 2019 – 2023

17 Cause Codes EFD May Capture w/ Limitations	
Cause Code	Event Ranking
Animal	2
Control Trouble	20
Damage by Adjacent Fault	N/A
Distribution Xfmr Overload	N/A
Feeder Overload	N/A
Fire on Company Equipment	N/A
Flooding	25
Fuse Fatigue – Mechanical	N/A
Fuse Fatigue - Electrical	N/A
Guy Slack or Broken	N/A
Slack	N/A
Snow or Ice	N/A
Vandalism	19
Wind	N/A
Unknown	5
Tree Fell	1
Tree Fell – Emerald Ash Borer	N/A

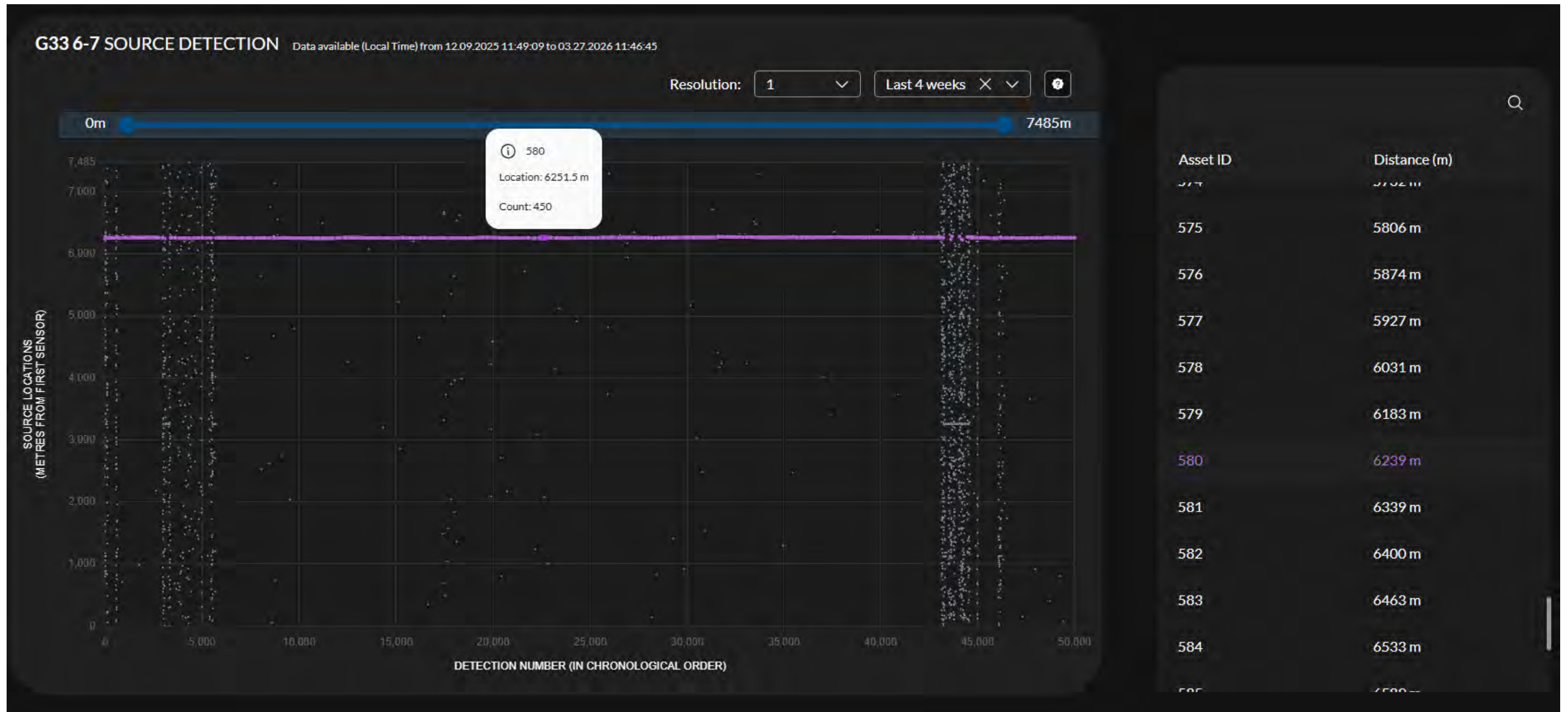
* These Cause Codes Account for 51% of the Total Interruptions Over a 5 Year Period from 2019 – 2023

19 Cause Codes EFD Will Most Likely Not Detect	
Cause Code	Event Ranking
Construction by Company	17
Non-Company Activities	13
Crane, etc. – Other	N/A
Dig-In	N/A
Duct Broken	N/A
Human Contact	28
Improper Application	18
Other Company Activities	11
Lightning	8
Operating / Testing Error	22
Tension Excessive	N/A
Vehicle	6
Tree of Limb Cut by Company	N/A
Tree of Limb Cut by Others	N/A
Replace OFCs	N/A
Construction by Contractor	21
Feeder Unbalance	28
Under Frequency	N/A
Under Voltage	N/A

* These Cause Codes Account for 14% of the Total Interruptions Over a 5 Year Period from 2019 – 2023

What does Data look like?

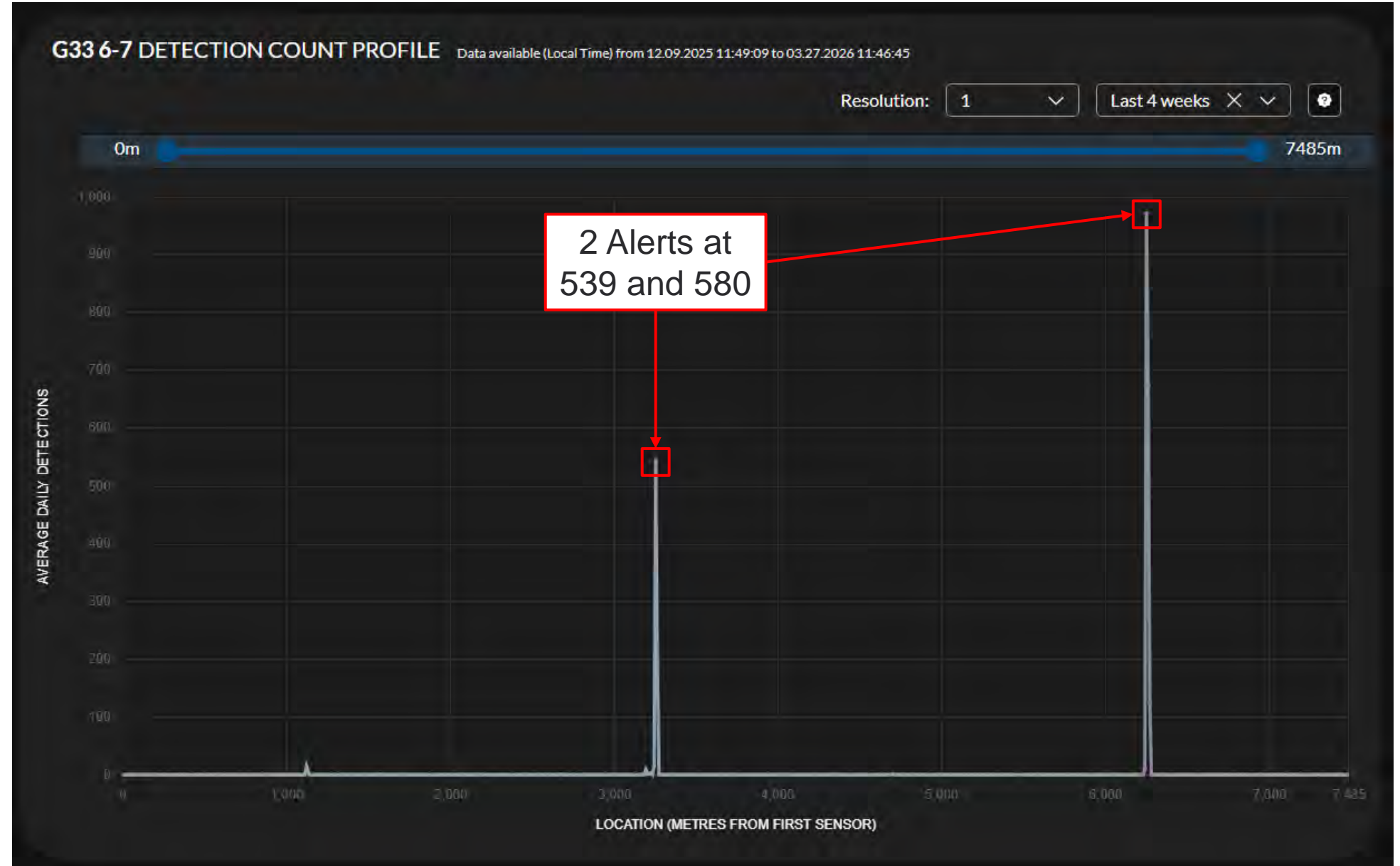
Location is ~10m from structure 580 > likely located right at the structure



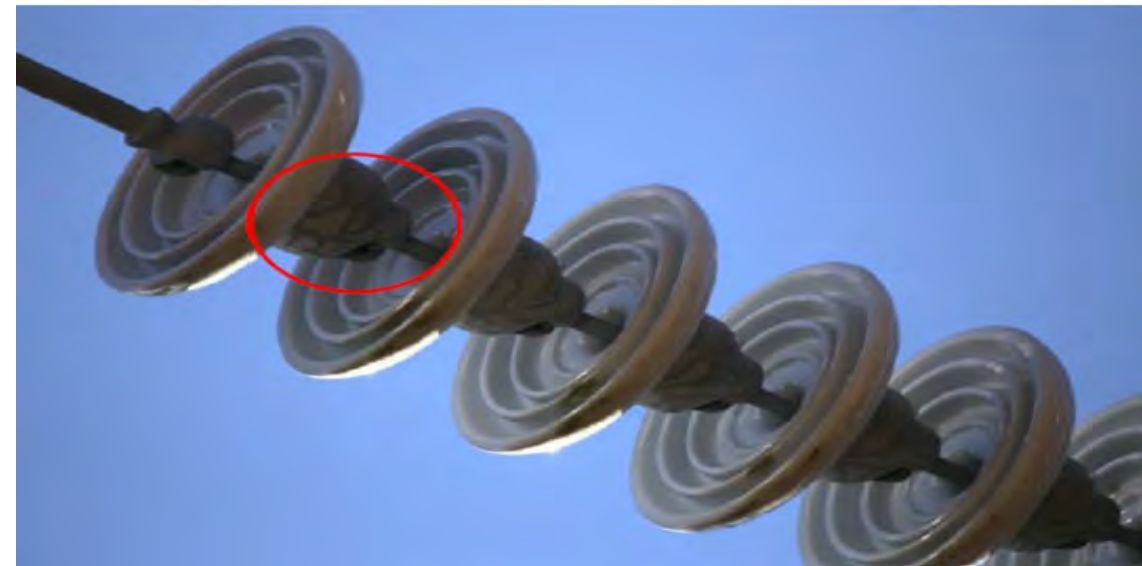
What does Data look like?

Alternate view showing both alerts

Can refine the area (how far from each sensor) to target specific structures



69kV Transmission Line Insulator Findings



EFD Finding:- UG Riser Tracking



EFD Finding: Vegetation Contact / Spacer Cable Insulation Degradation

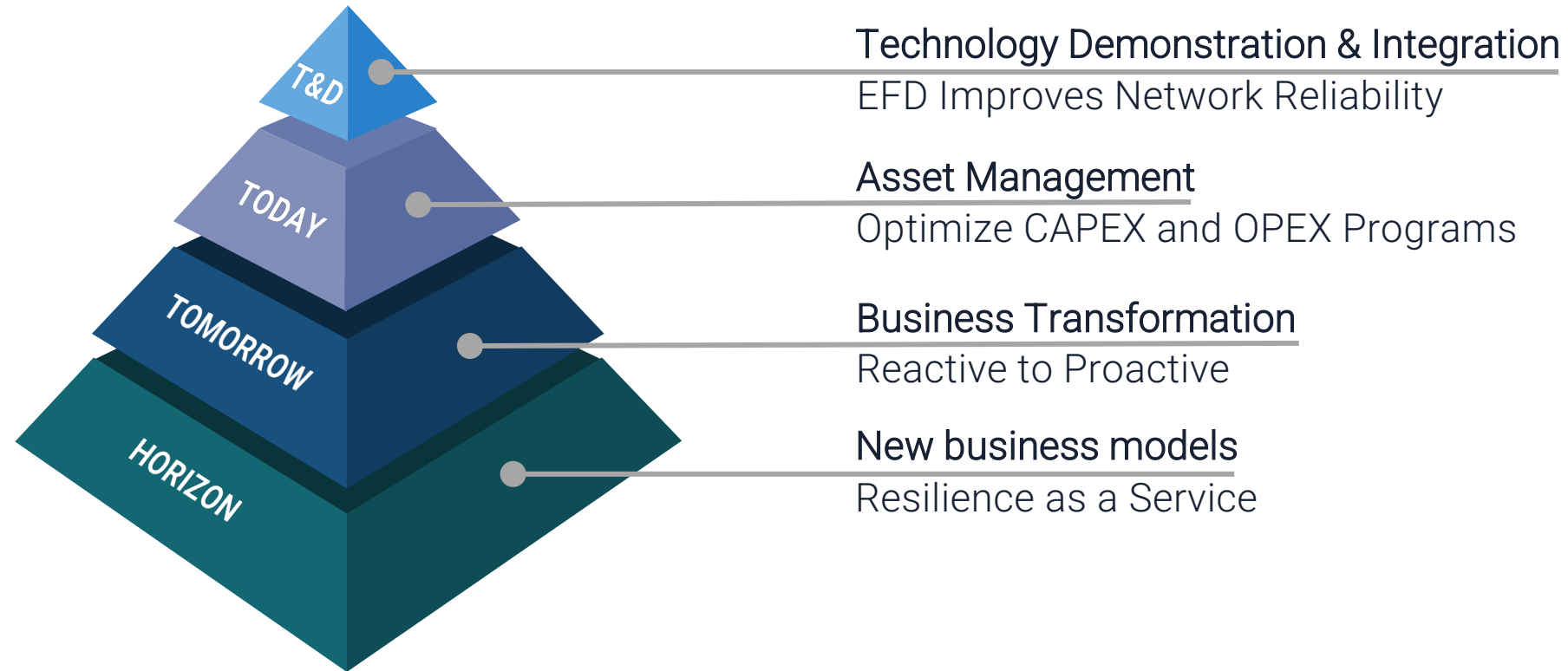


- **Precise Locational Accuracy of Fault**
- **Alert – Tree Cut Back from Main Lines**
- **Fire and Safety Risks Mitigated**
- **Efficient Planned Operation**
- **Alert halted after the Veg Removal**

EFD Finding: Invasive Vegetation / Primary Contact & Fault Location



ROADMAP



EFD has the potential to transform our business by controlling costs, increasing efficiency, and improving reliability.

Next Steps

- Continue to Target Worst Performing Circuits to Mitigate Penalty / Fine Risks
- Technology Demonstration Expansion – Monitoring Tap Lines
- Look at Opportunities for Sub-T

EPRI's Overhead Distribution Grid Monitoring Technology Test Approach



Joe Potvin
Program Manager – Distribution Systems

**Electrical Discharge Inspection and Monitoring Interest
Group**
April 16, 2026

The Challenge

Conditions

Utilities
maintaining
aging
infrastructure

Grid
experiencing
stress it wasn't
built for

Traditional
inspections
provide a
snapshot

Pressures

Reduce O&M

Increase
reliability

Increase
'resilience'

How can utilities optimize the pressures, given the conditions

Current State of Asset Health Awareness

Inspect on a cycle (keep down costs)

Prioritize circuits based on age, performance, criticality (optimize bang for buck)

Select inspection approach based on cost, efficacy, ability to prioritize and take action (visual, thermal, radio frequency (RF), etc.)

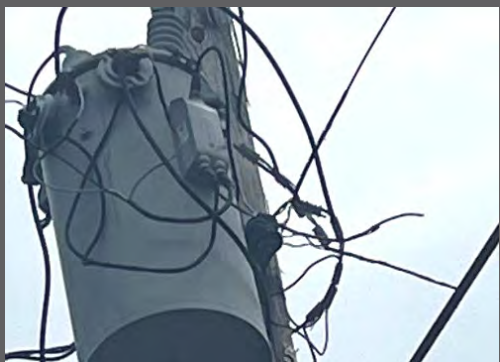
A lot can happen between cycles

Some circuits need more attention than others

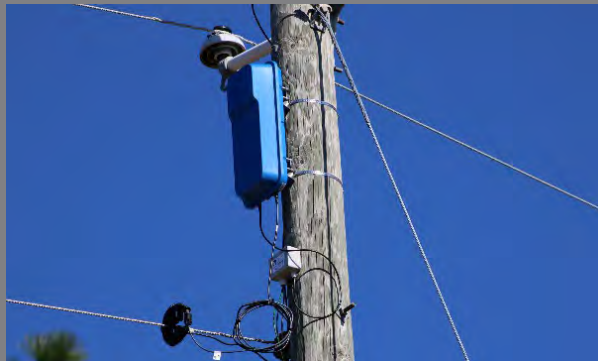
No one 'silver bullet' that will always give you a full picture while you're inspecting

Distribution Monitoring Technologies

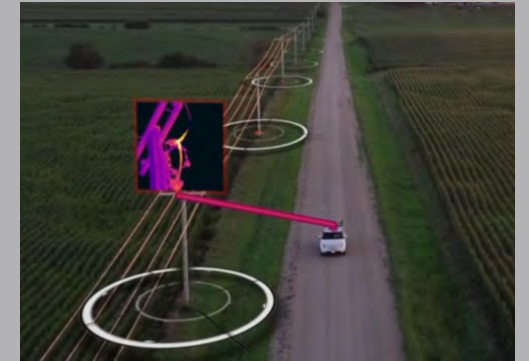
Asset Sensors & Monitors



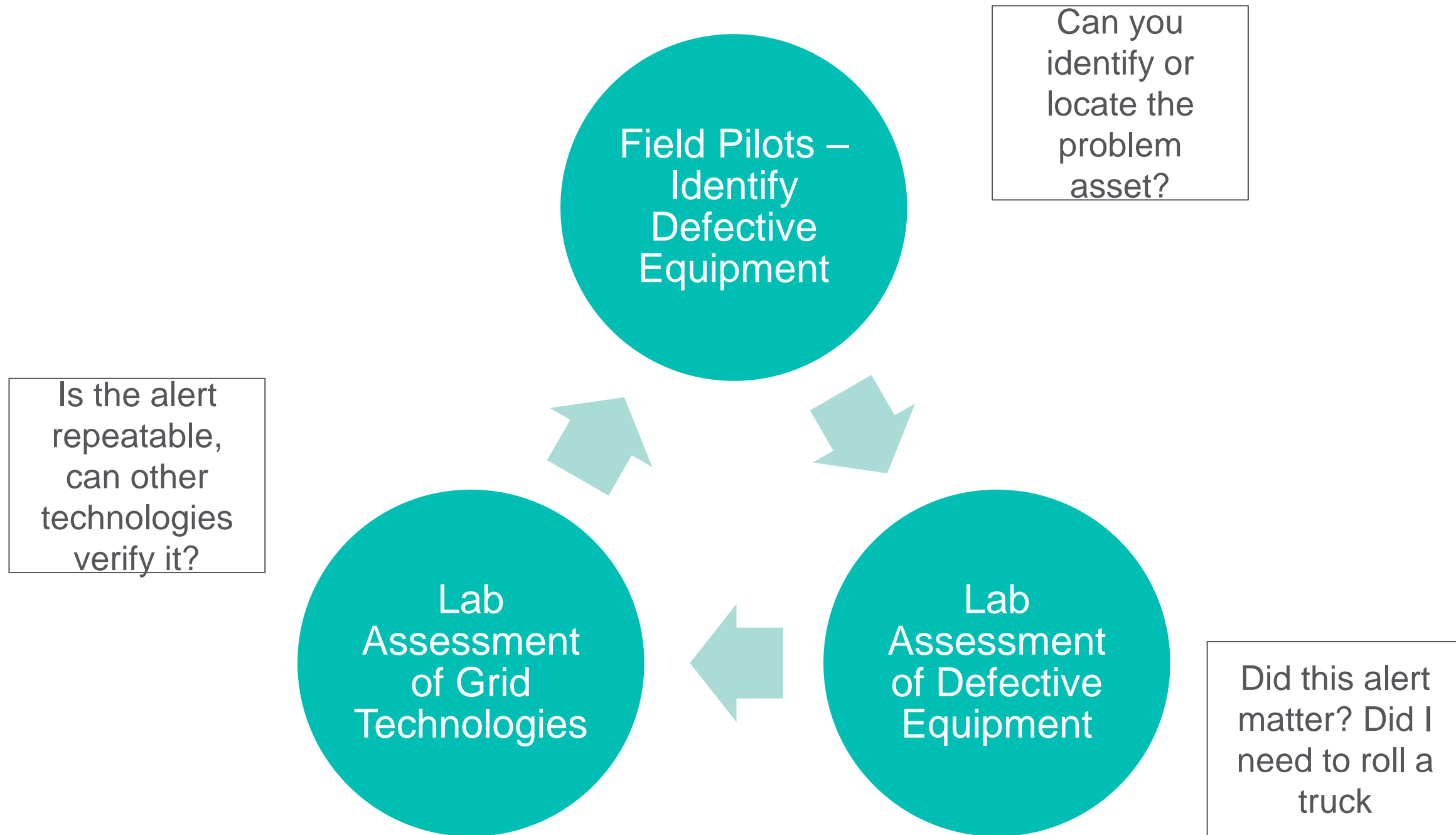
Non-Contact Online Monitors



Imagery & Remote Sensing



Accelerating the Adoption of New Tech by De-Risking



Field Pilots – Identify Defective Equipment



EPRI demonstrated PREMS II mobile scanning technology at a utility and identified arresters as a noise source

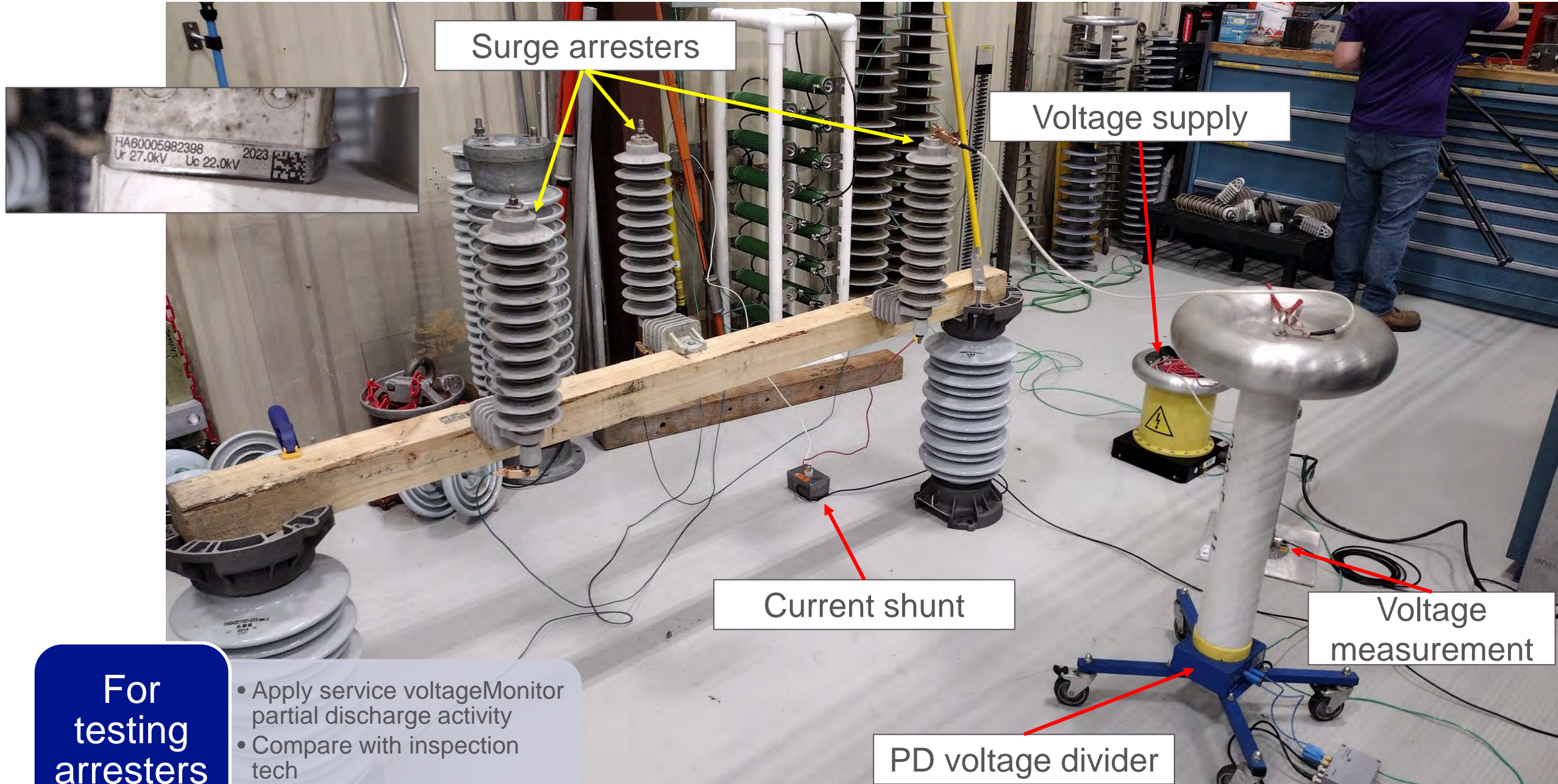
The utility removed the arresters from service and sent to EPRI for analysis

Questions

Are one or more arresters defective?

If they are defective, does it matter?

Lab Assessment of Defective Equipment



Application of Inspection Technologies

Fluke Ultrasonic Imager



PD Hawk



FLIR IR Camera



DayCor

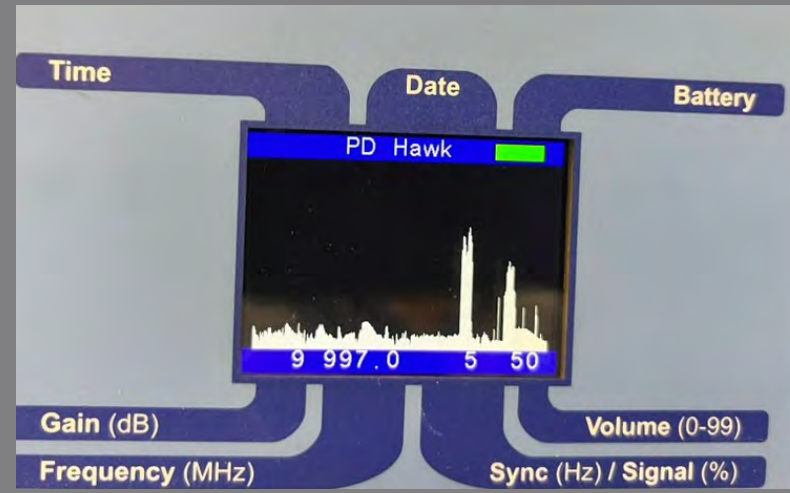


Results from arrester assessment

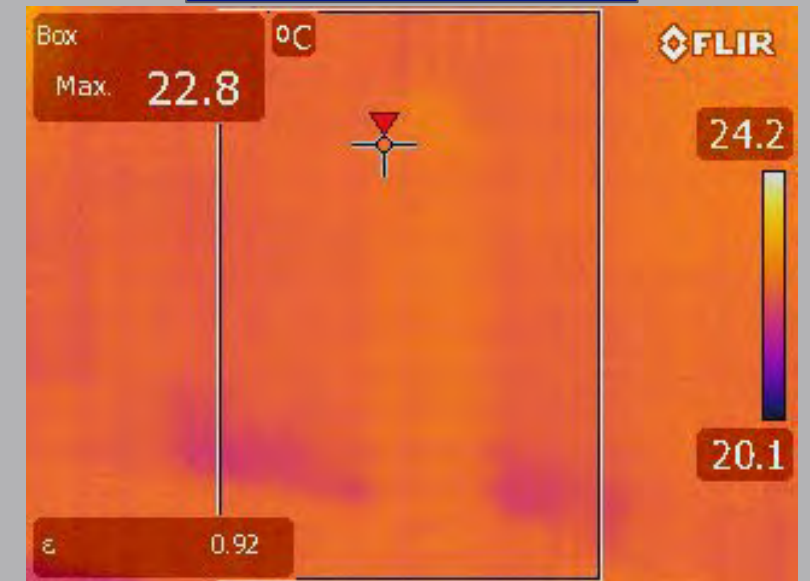
Acoustic Imager



PD Hawk



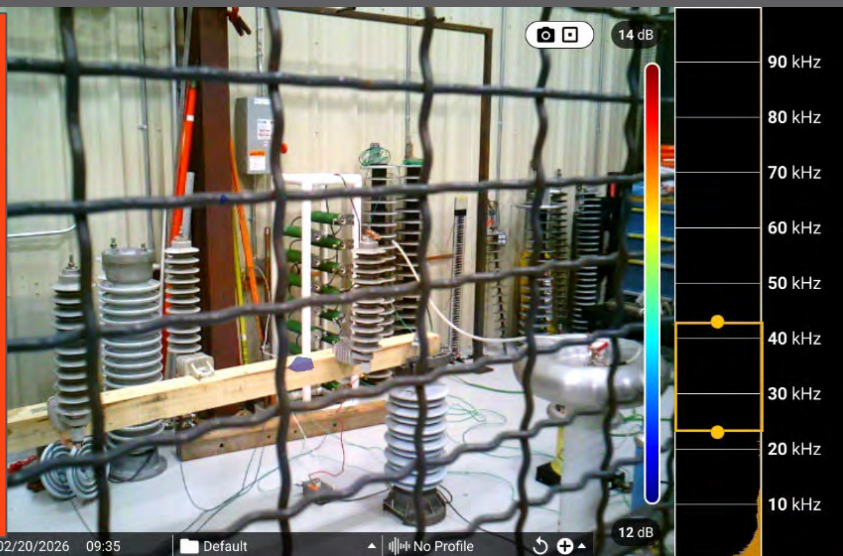
Infrared Camera



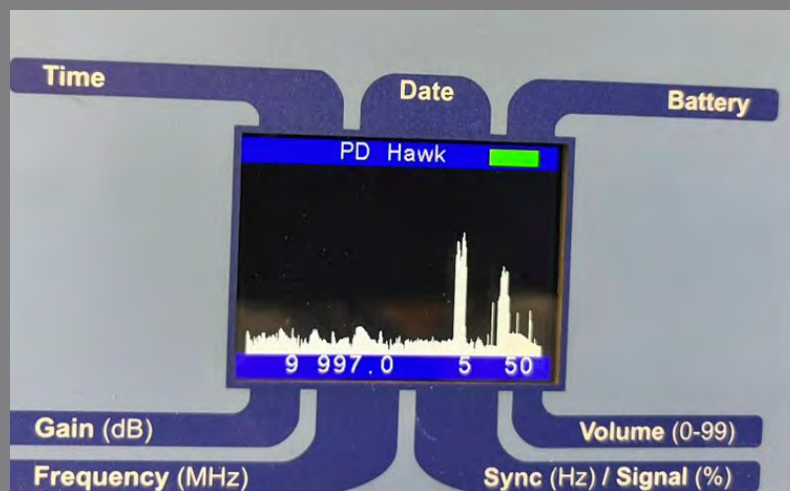
Results from arrester assessment

Acoustic Imager

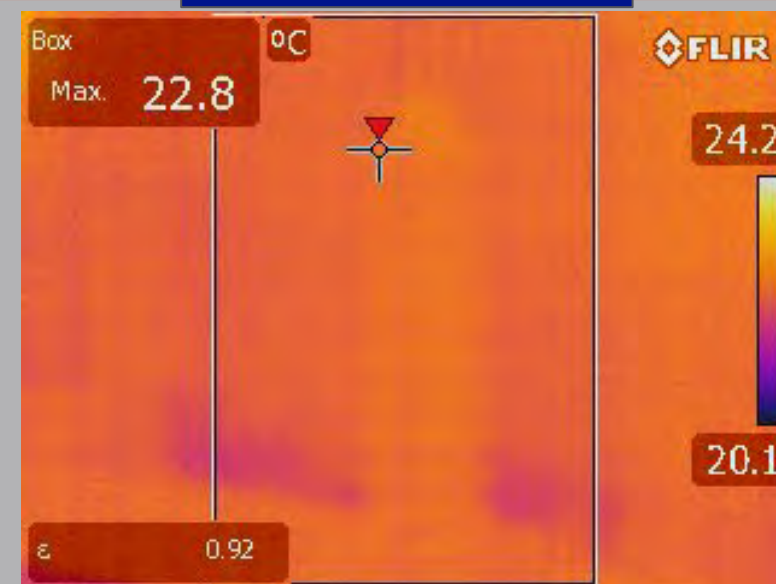
Good condition



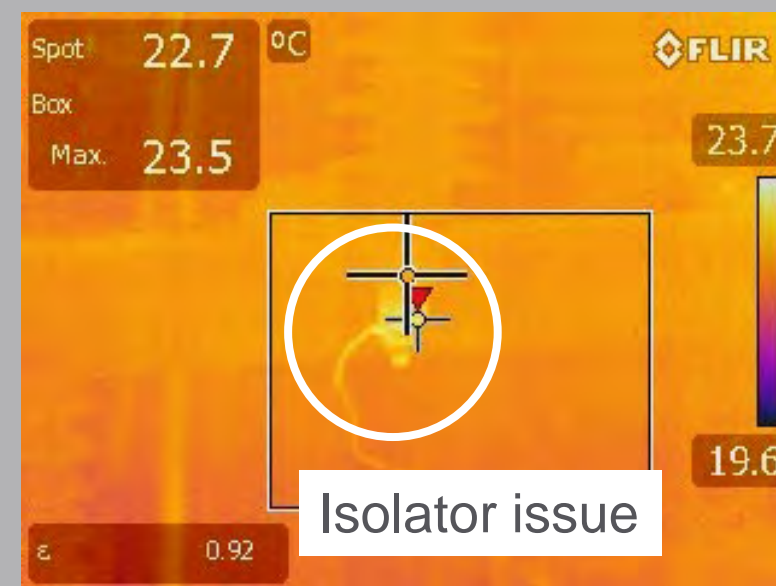
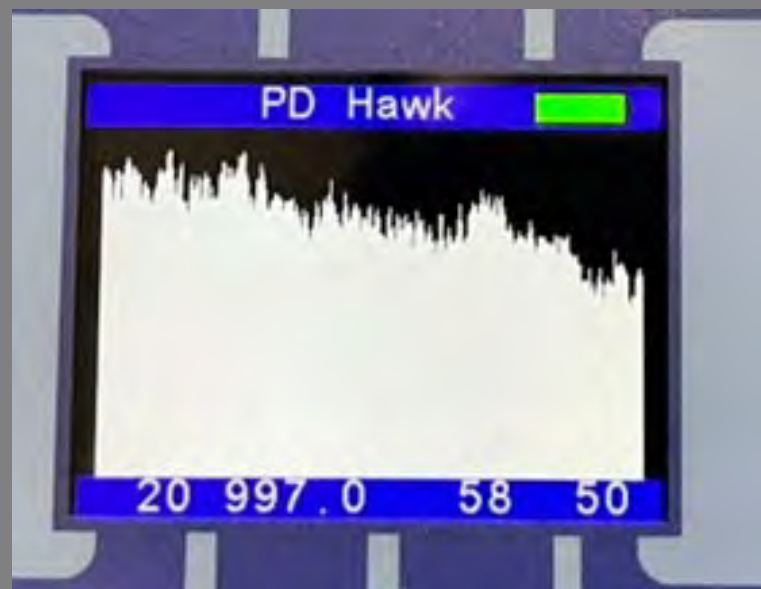
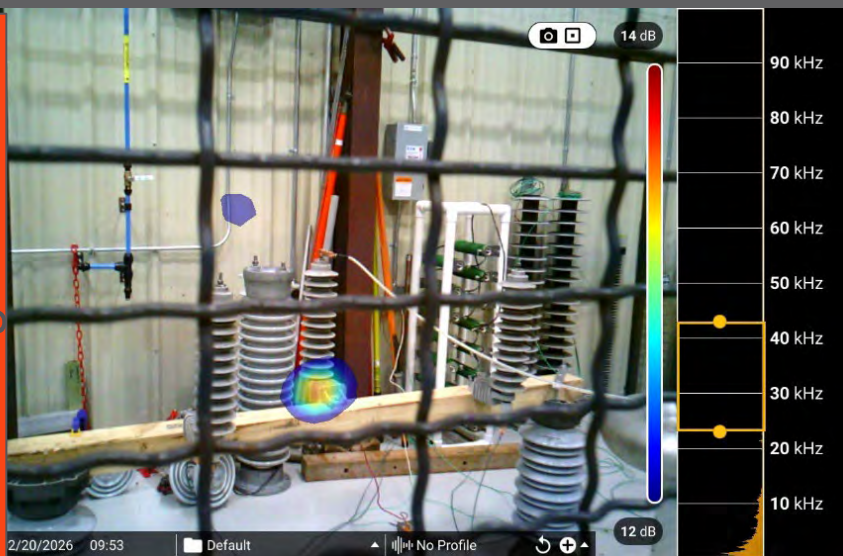
PD Hawk



Infrared Camera



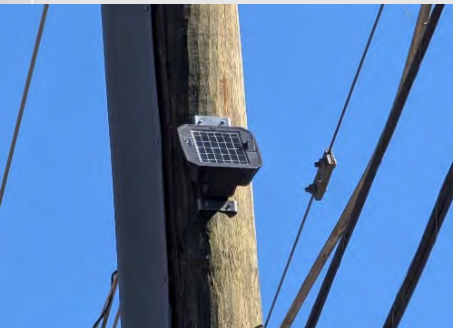
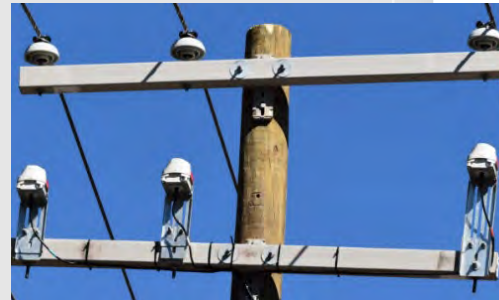
Degraded



Lab Assessment of Grid Technologies

Next step – install good and degraded arresters on distribution line at EPRI Lenox laboratory

Investigate grid monitoring technology's ability to detect the defect



Example Two – Monitoring and Diagnostics for Future of Distribution

Objective: Evaluate the value of online monitoring, remote sensing, and asset monitoring technologies

Approach: Pilot multiple technologies on four distribution circuits to compare the technology performance.

EPRI Role: Project manager and principal investigator supporting the selection of sensors, documentation of findings and facilitating data analytics.



Line Sensors



Transformer Monitors



Pole Monitors



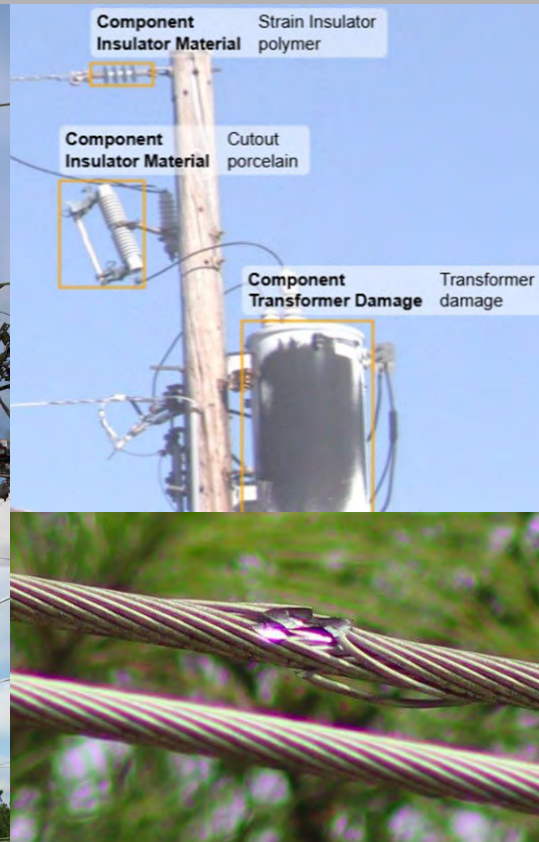
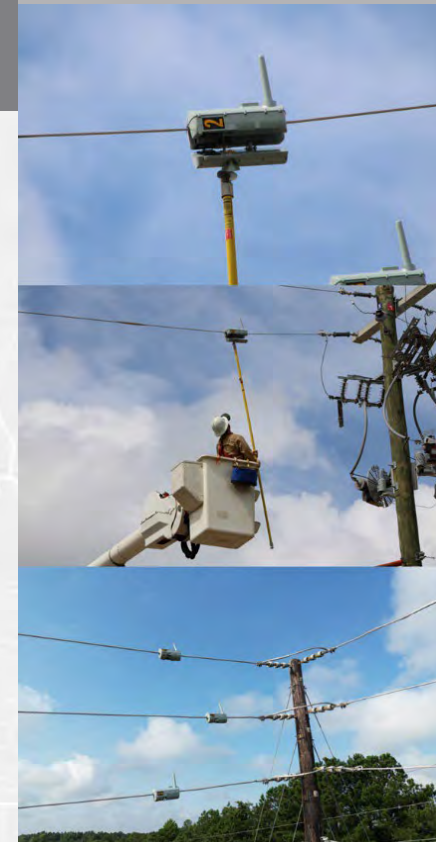
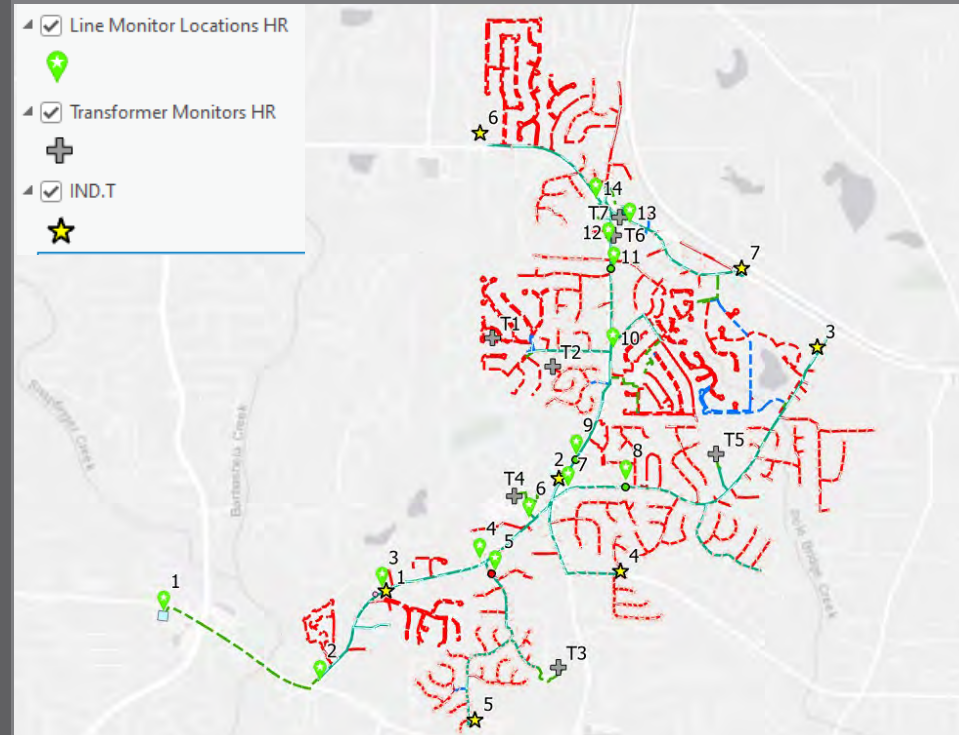
Grid Monitors



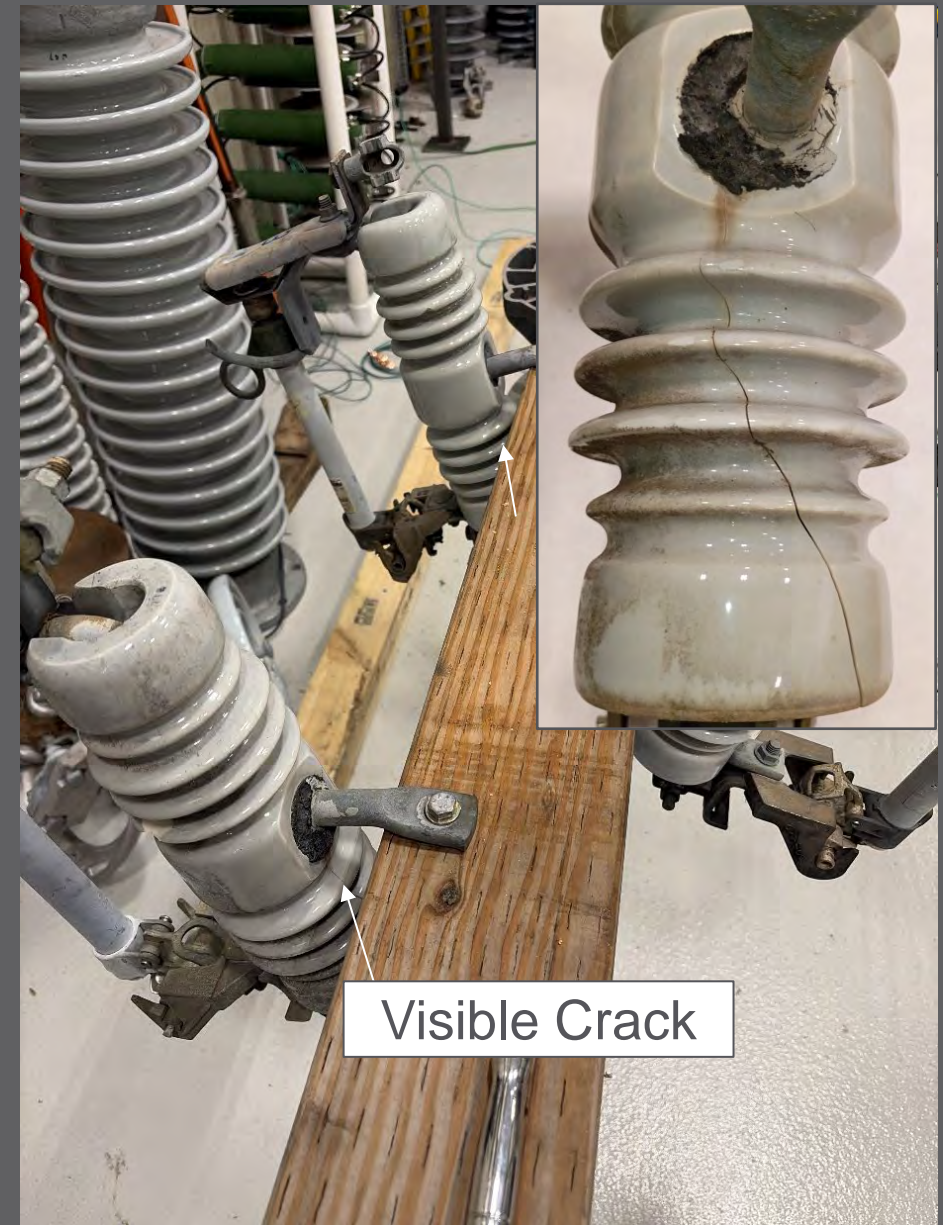
Vehicle-Based Imagery



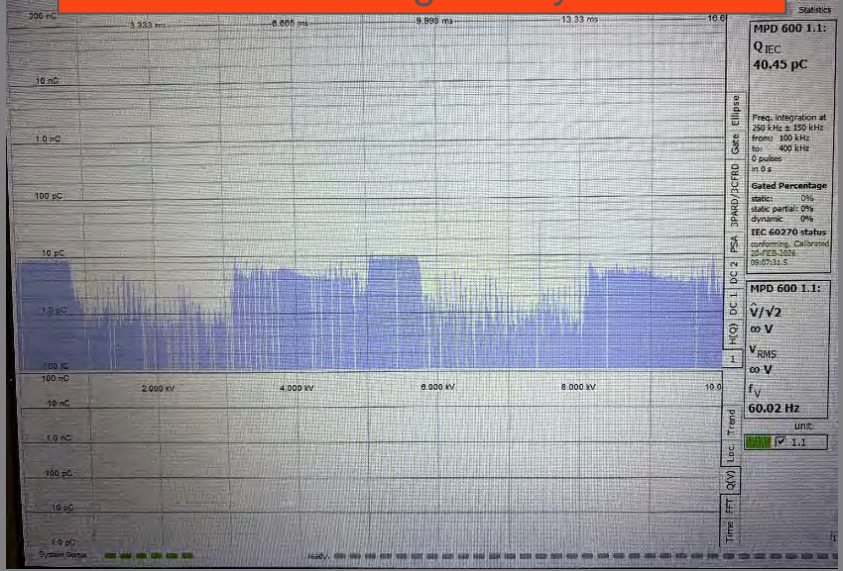
Satellite Imagery Analytics



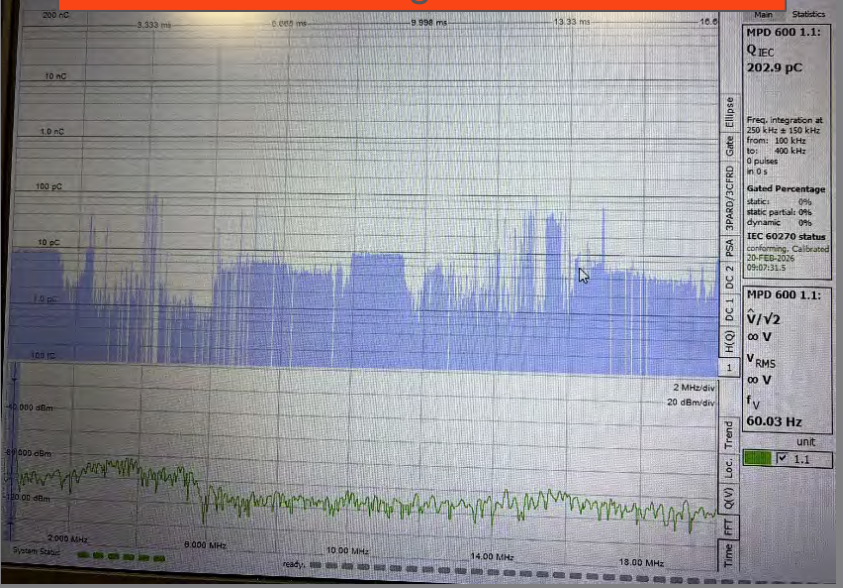
Damaged Porcelain Fuse Cutout Example



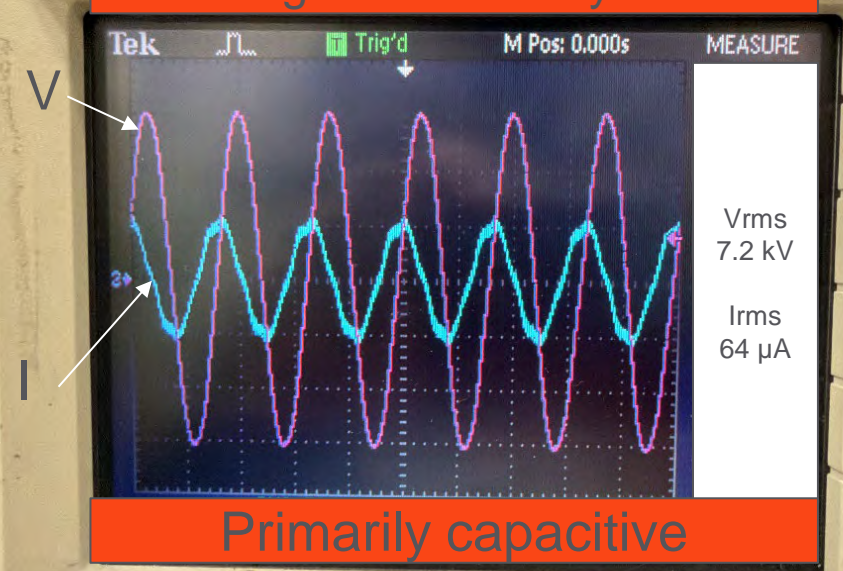
Partial discharge – Dry cutout



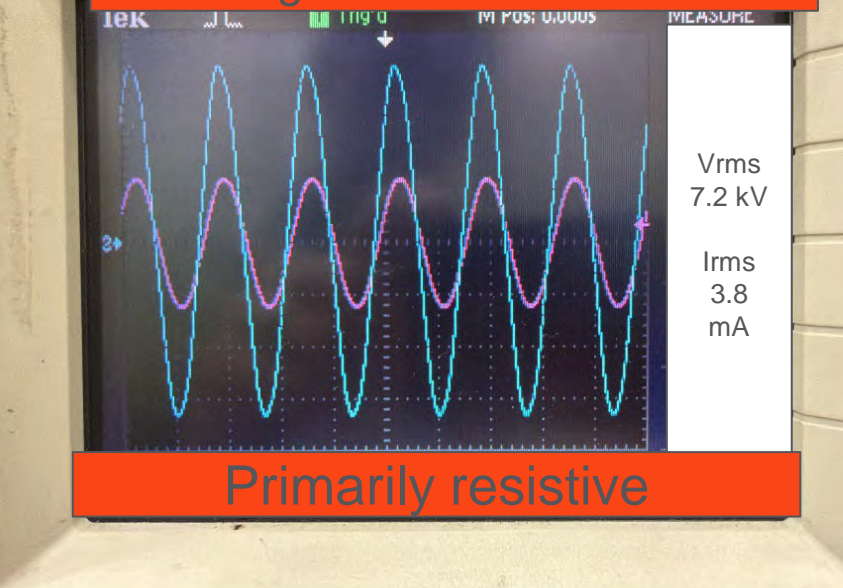
Partial discharge – Wet cutout



Leakage current – Dry cutout

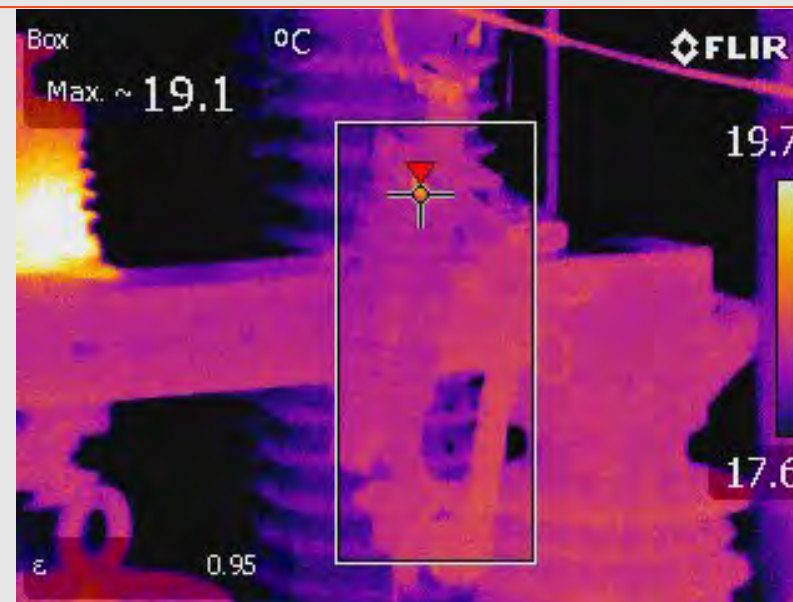
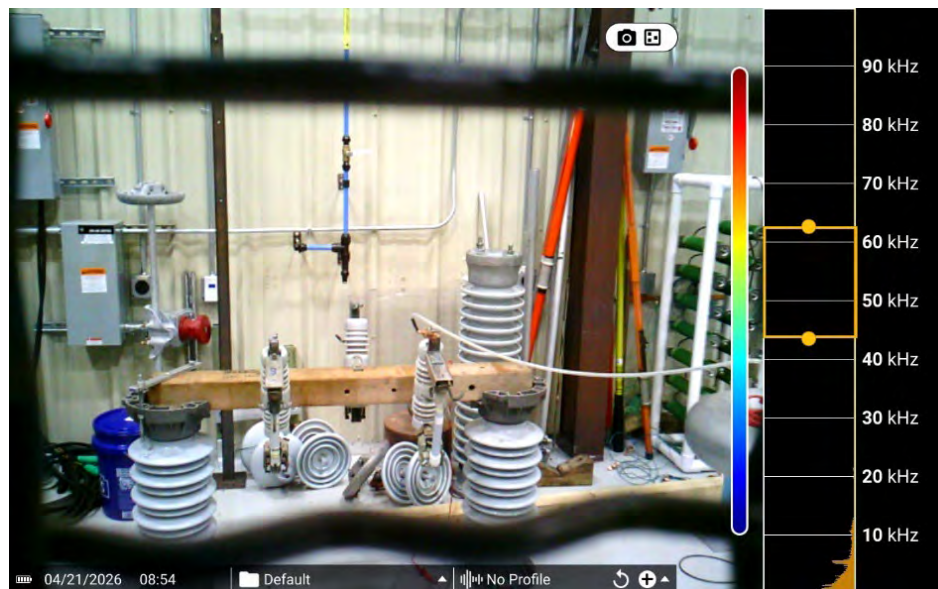


Leakage current – Wet cutout

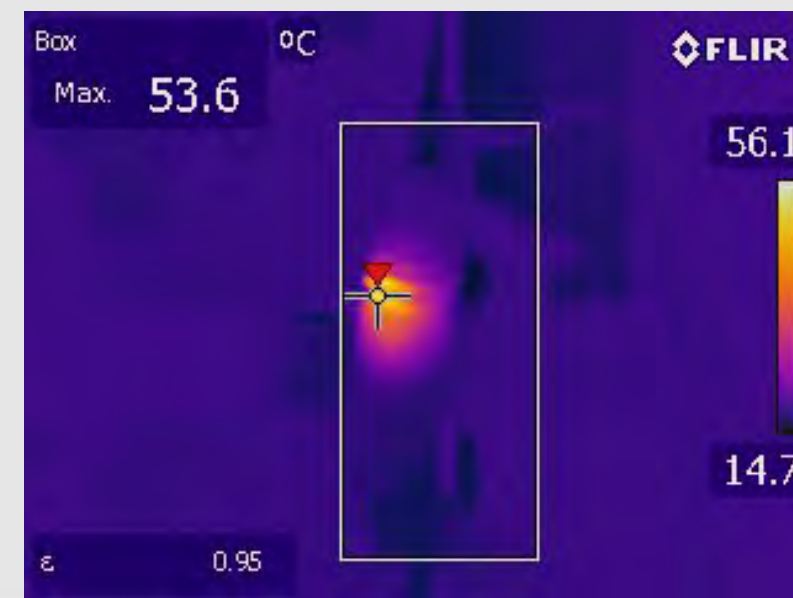
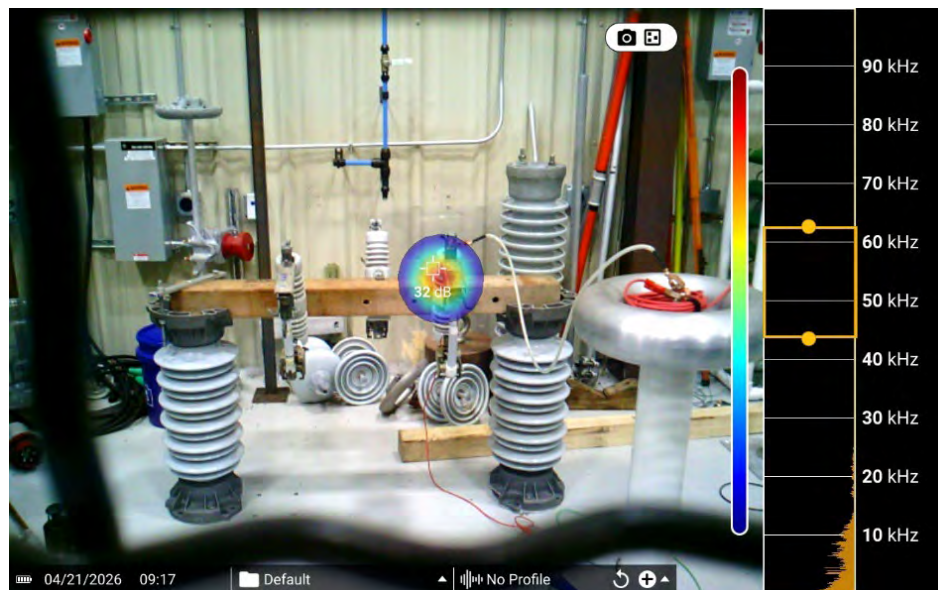


Damaged Porcelain Fuse Cutout Example

Dry cutout



Wet cutout

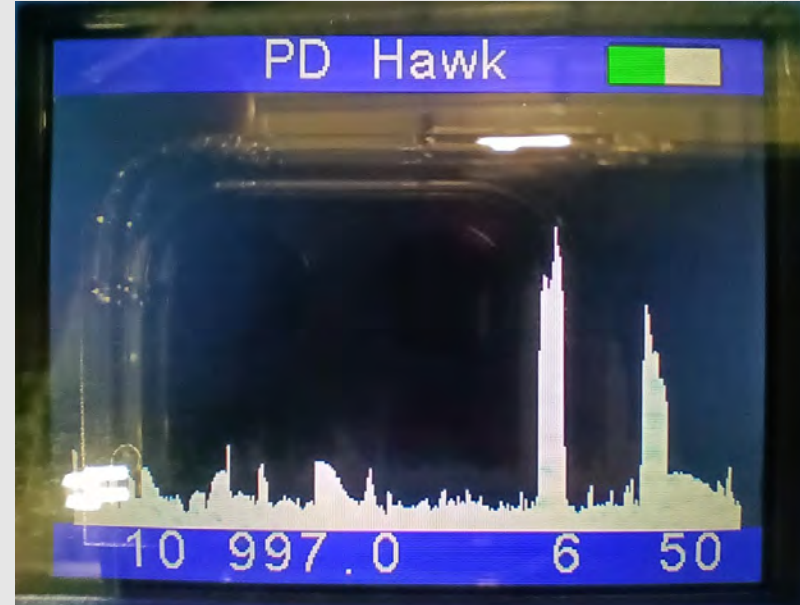
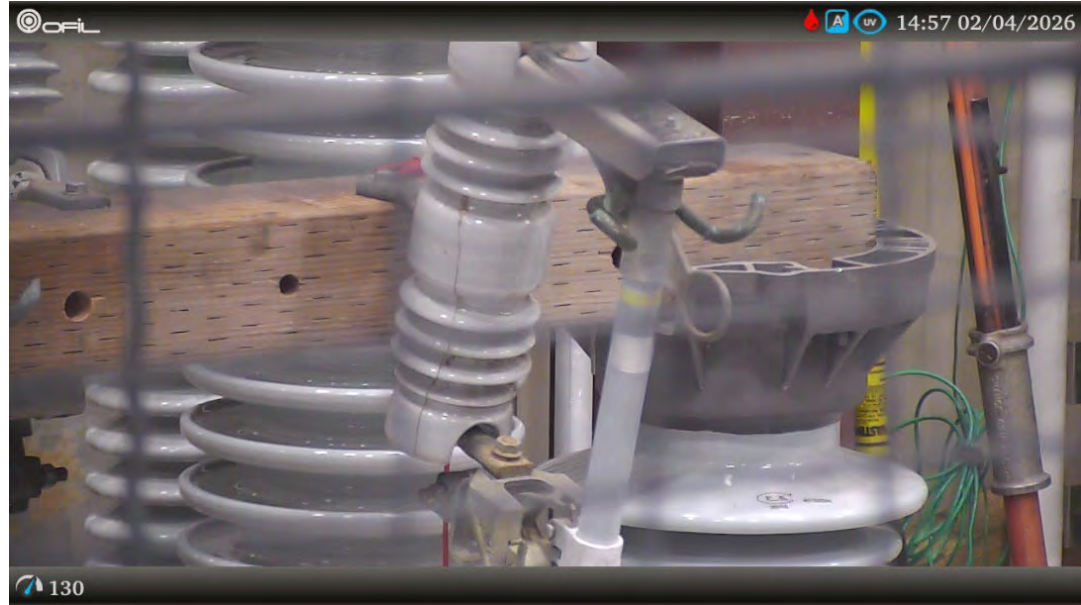


Acoustic Imager

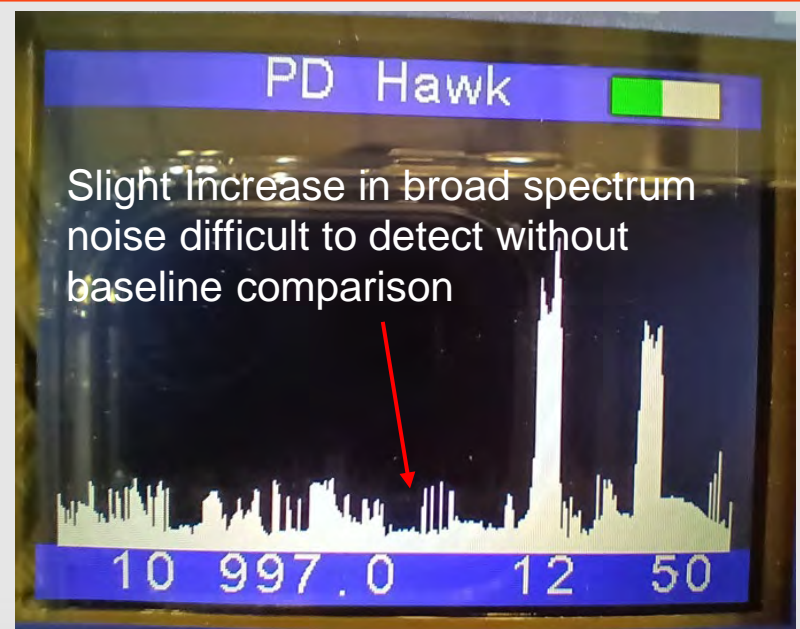
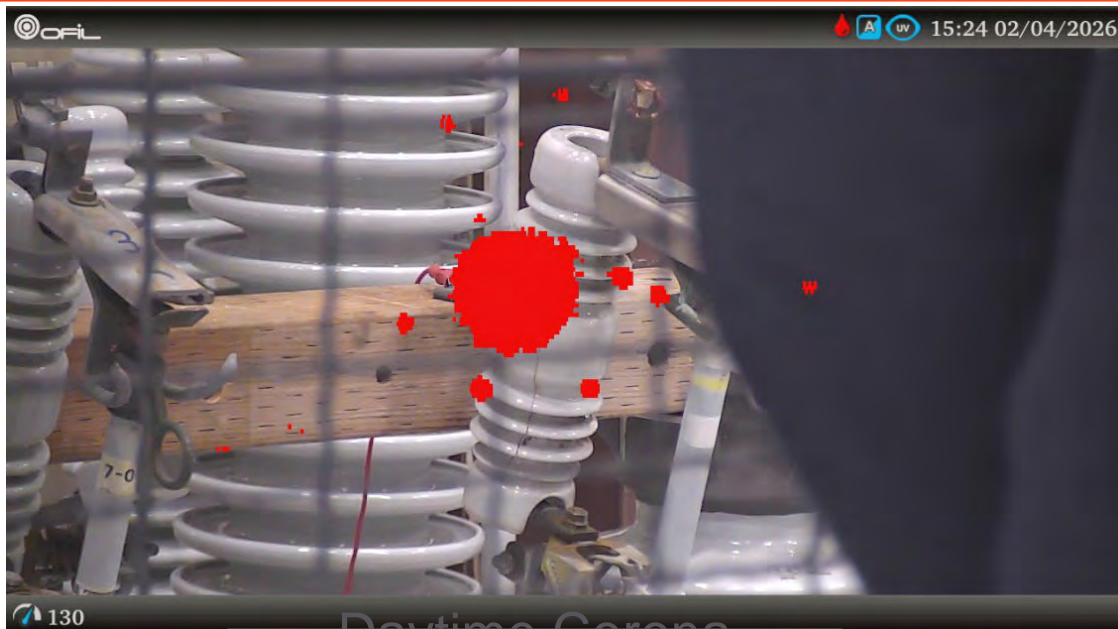
Infrared Camera

Damaged Porcelain Fuse Cutout Example

Dry cutout



Wet cutout

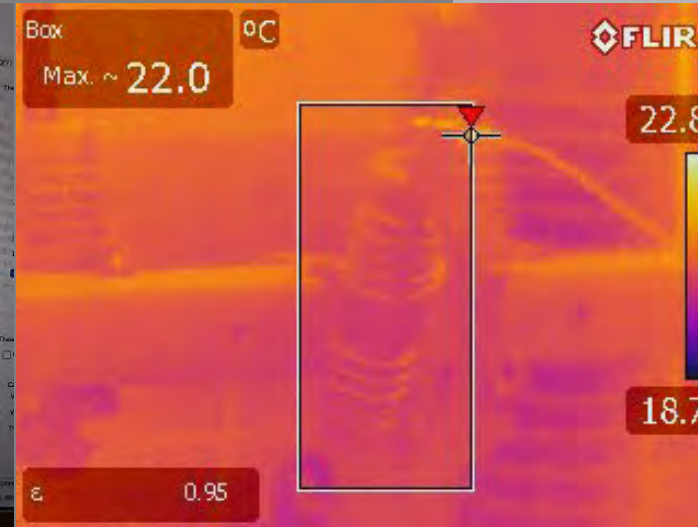
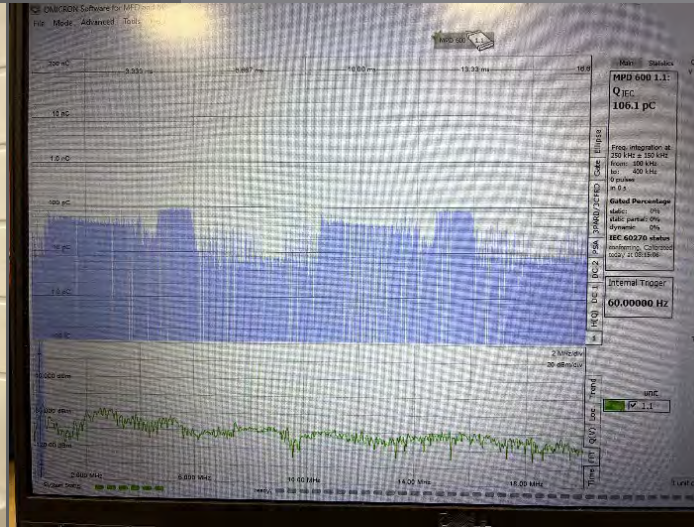
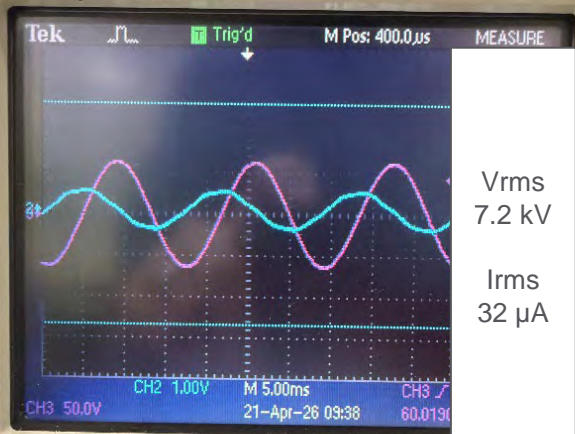


Daytime Corona Camera

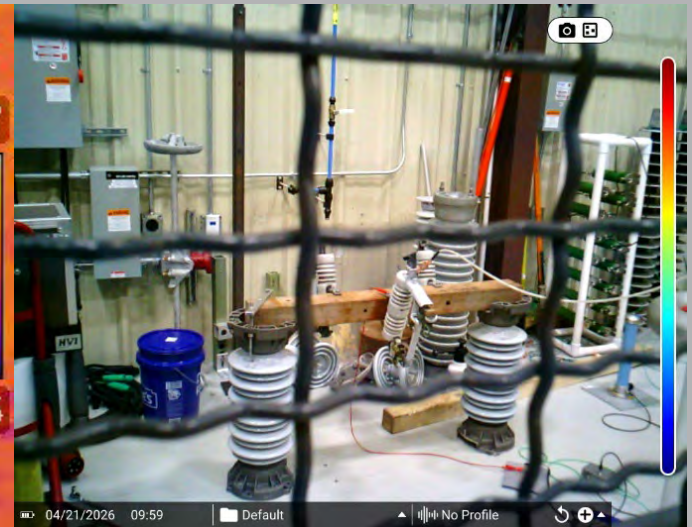
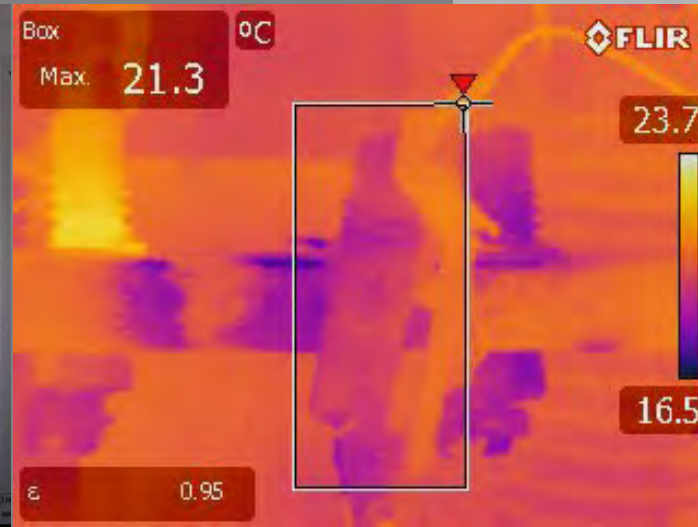
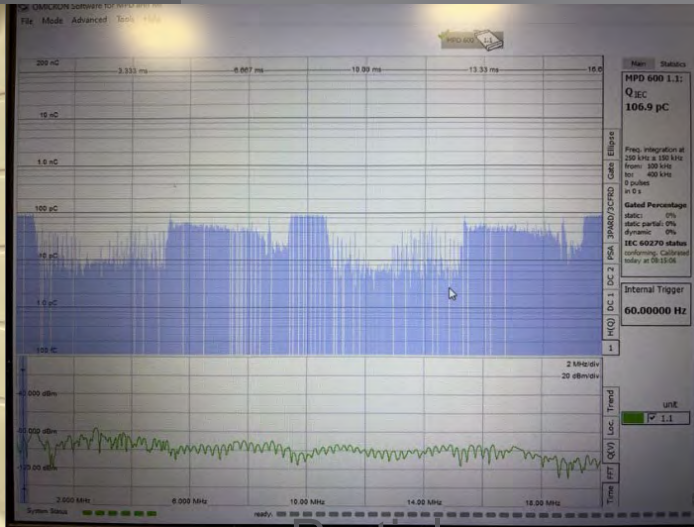
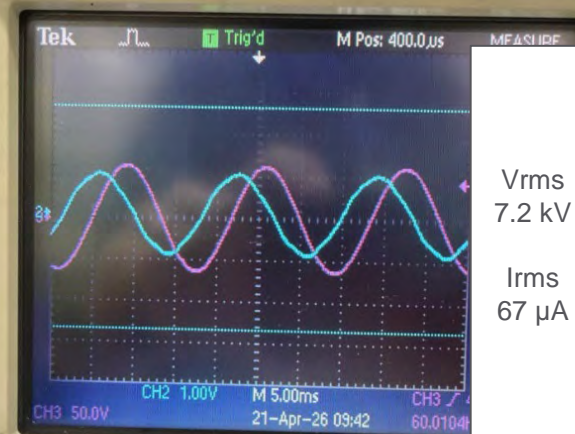
PD Hawk

Compare with Non-Damaged Cutout

Dry cutout



Wet cutout



Oscilloscope

Partial Discharge

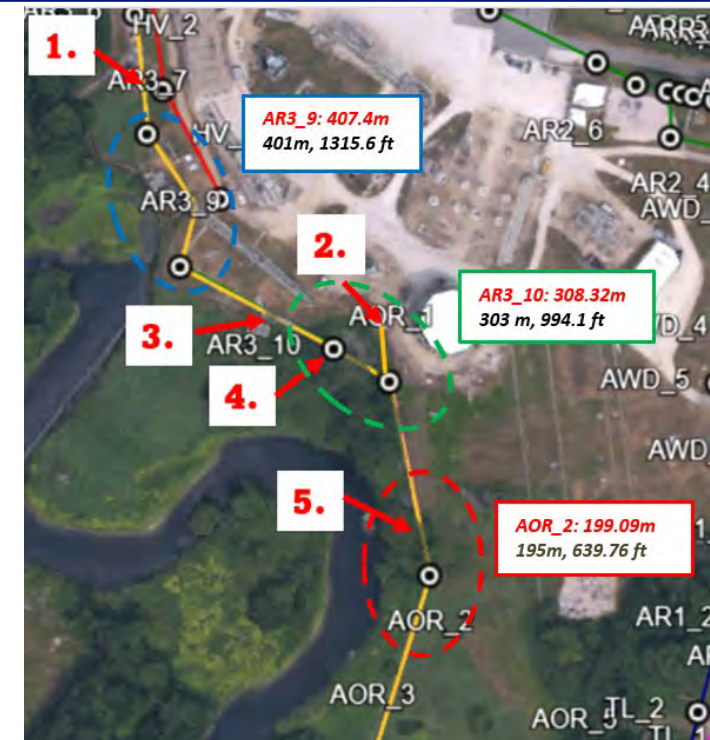
Infrared Camera

Acoustic Imager

Lab Assessment of Grid Technologies

Next step – install good and degraded cutouts on distribution line at EPRI Lenox laboratory

Investigate grid monitoring technology's ability to detect the defect

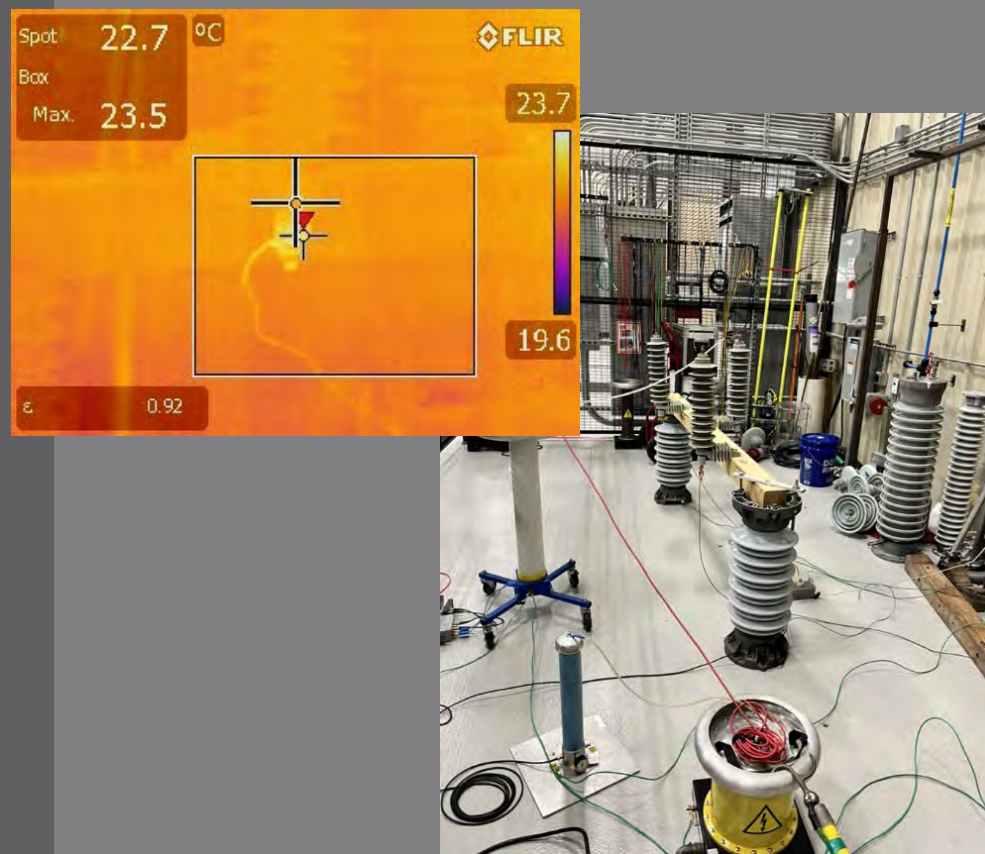


Overview of EPRI Approach

Identify degraded assets using grid monitoring or inspection technologies and remove prior to failure



Verify effective detection methods by energizing and assessing in the lab



Installing on a fully monitored line to assess grid monitoring techs ability to detect and locate

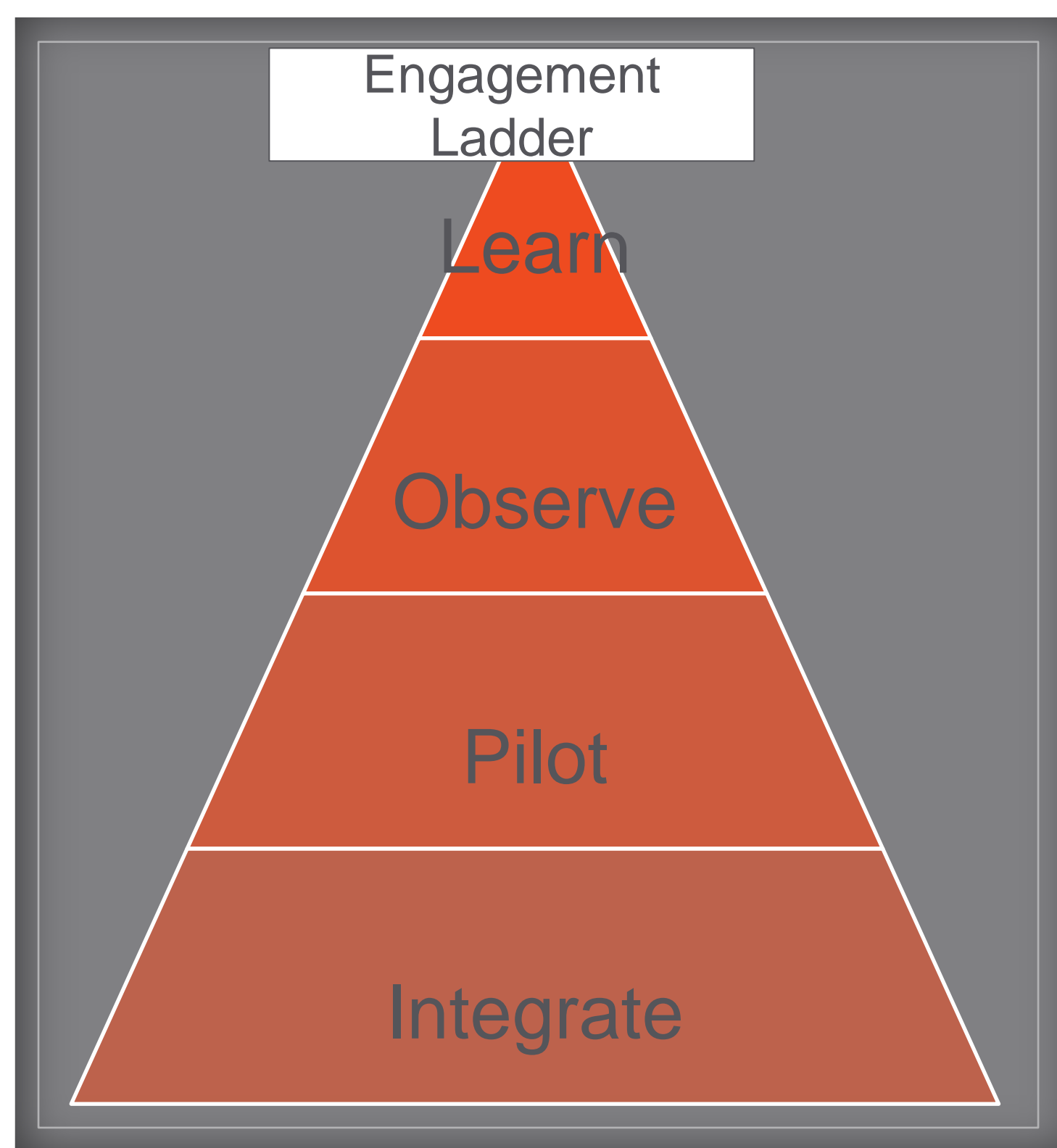


Three Questions Every Utility Should Ask

Where are we currently blind on our overhead system?

Which failure modes matter most for our grid?

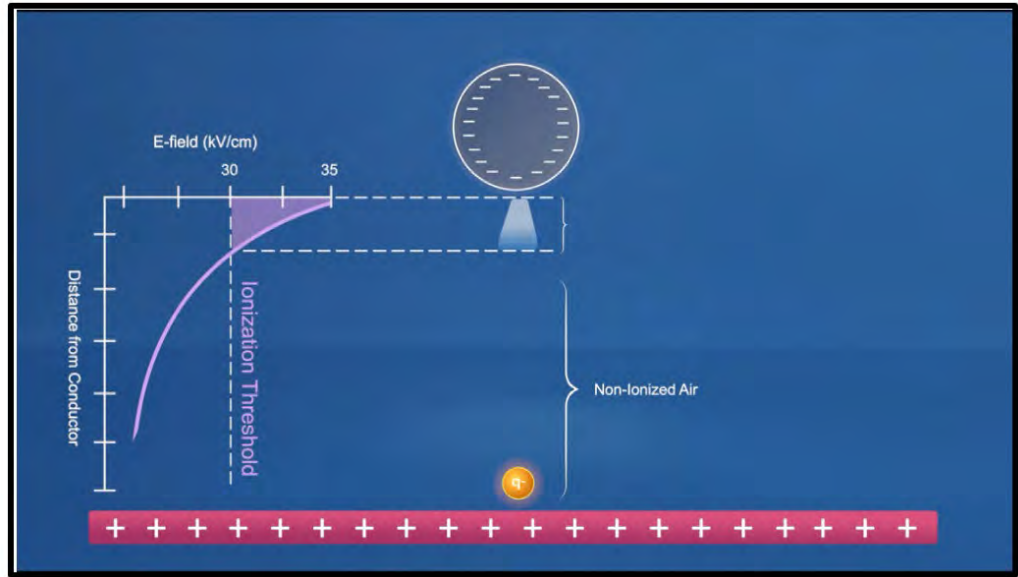
What decisions would we make differently if we had earlier warning?





**EPRI Daytime Discharge Inspection Training
and other EPRI Resources**

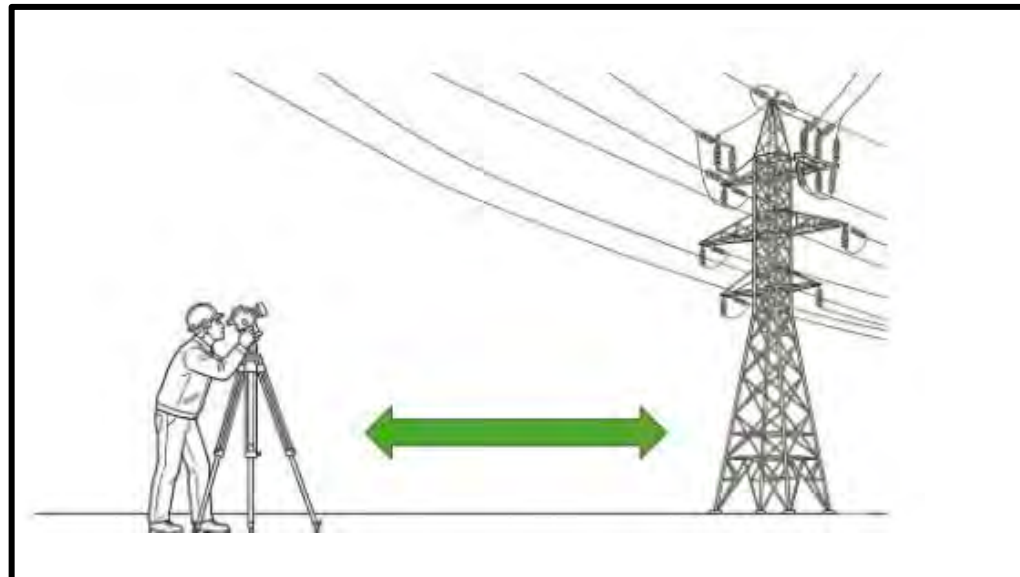
Daytime Discharge Inspection Training – CBT – July 2026



Lesson 1: Corona & Arcing Fundamentals



Lesson 2: Principles of Camera Inspection



Lesson 3: Consideration for Conducting an Inspection

Name:	Broken & Raised Strands	Discharge Type	Corona
Location:	Lines	Risk:	Customer Complaint (audible noise RFI) Failure (dependent on # strands)
Component:	Conductor		
Dependance:	Voltage, Conductor Bundle & Damaged Strand Dimensions		
Action:	Repair – priority depends on degree of damage		

Lesson 4: Interpreting Inspection Results

VOLUME 3:
CHAPTER 5

Daytime Discharge Inspection of Overhead Transmission Lines

Overhead Transmission Inspection,
Assessment, and Asset Management
Reference Guide—2024



Available from www.epri.com: 3002030264

Presently Available EPRI Reference & Field Guide



Field Guide: Daytime Discharge Inspection of Transmission and Distribution Overhead Lines and Substations

Guide with Video

3002030196

Available from www.epri.com: 3002030196

Optimized for Electronic Viewing



Roundtable and Guidance

Roundtable

- Please Indicate
 - Any questions you would like answered?
 - What could be done to make EDIM more valuable?
 - When are you prepared to present your experience? (please volunteer)
- How to Engage Technology Providers?
 - Share latest product offerings?
 - Latest results?
 - What portion of meeting would they attend?



[Electrical Discharge Inspection Monitoring Future Meeting Poll](#)

Please take a few moments to complete the questions in this poll to help us plan future EDIM Meetings.

Sharing is a great way to learn!



TOGETHER...SHAPING THE FUTURE OF ENERGY®