EPIC-3, Project 3

Application of Advanced Metering Infrastructure (AMI) Data to Advanced Utility System Operations

Thomas Bialek, PhD, PE

November 9, 2018

Background

- SDG&E has made a foundational AMI investment
  - Primary use is consumption measurements
  - Power off notifications used for Distribution Operations
- AMI system has the potential for other uses
  - System upgrades required
  - Provide visibility into distribution system

Objectives

- Pre-commercial demo leveraging SDG&E's AMI system to provide actionable secondary voltage data and analysis to staff and other prospective users.
  - Voltage sensor network
  - Phase identification
  - Primary circuit model validation
  - PV Impacts
  - Power quality and safety issues
    - Arcing connections

Approach

- Cooperative Research and Development Agreement with the National Renewable Energy Laboratory
  - 50% cost share
  - Leverage lab expertise
  - Secondary to primary voltage data translation tool
    - Validate primary circuit models
    - Improved information for policy makers

Approach

- Phase ID
  - Lack of accurate maps beyond 3 phase devices
  - Monitor voltage changes to map meter to transformer and transformer to phase
  - Evaluate vendors products for accuracy
  - Volt/VAr management

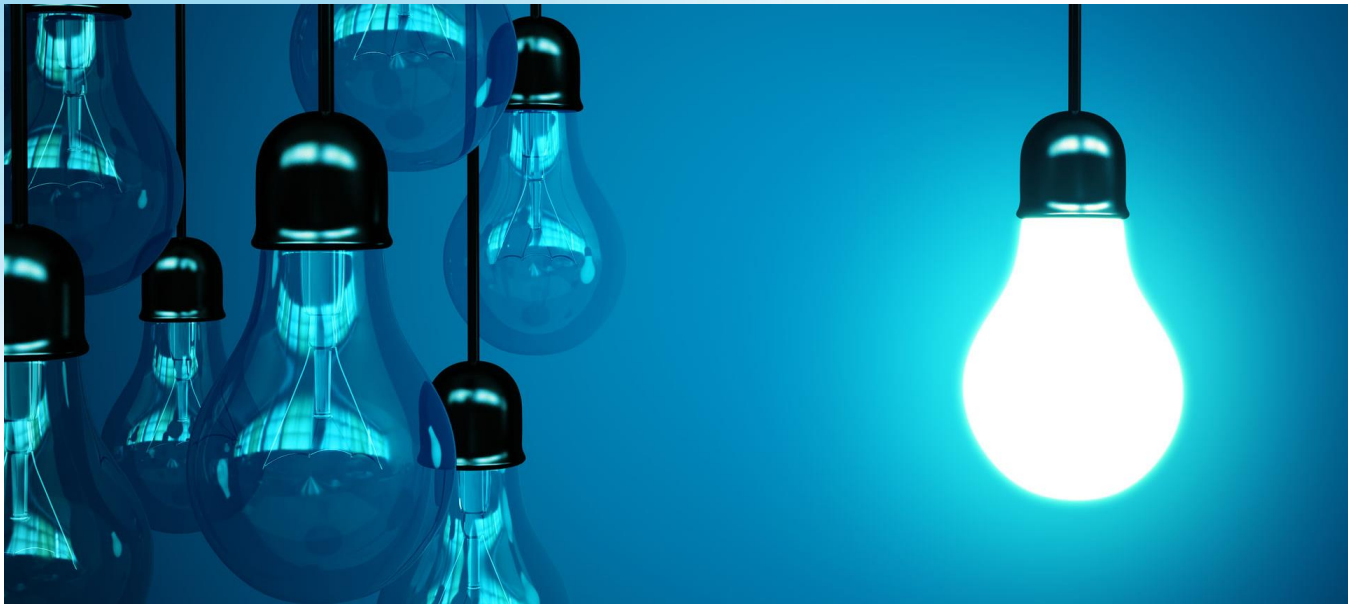
Approach

- PV Impacts
  - Pre and post PV installation analysis
  - Better inform models
  - Solution mix

Approach

- Power Quality and Safety Issues
  - Arcing Connections
    - Loose connections
    - Downed conductors

Discussion



Please tell us what you think!

EPIC-3, Project 4

Safety Training Simulators with Augmented Visualization

Kirsten Petersen
November 9, 2018

Background

- Safety training is very important for every job, and its importance is elevated when dealing with high voltage power equipment
- Training simulators can provide valuable simulated experience to electrical workers
- This project will demonstrate and evaluate safety training simulators that focus on safety management of field operations, back-end support, and crew proficiency and productivity

Objectives

- Pre-commercial demonstration of advanced safety training simulation capabilities
- Applications for field-focused design, operations, and asset monitoring/management solutions
- Latest simulator technologies to train utility industry personnel on safety-related issues, such as:
  - Wildfire prevention and wildfire fighting
  - Electric potential zones and grounding techniques
- Utilization of augmented reality tools

Approach: Focus

Wildfire risk training simulators with the following work areas:

- Fault location training
- Inductive potential zones and grounding training
- Equipment inspections and corrective actions

Approach: Fault Location Training

- Computer-based fault locating simulation and identifying fault distance
- Pinpoint which hazards (whether overhead or underground) contribute more significantly to wildfire risk
- Inspection enhancement:
  - Using locating simulation to train inspectors
  - Setting up fault scenarios to enhance their skills and training
- Identify various situations that could start fires

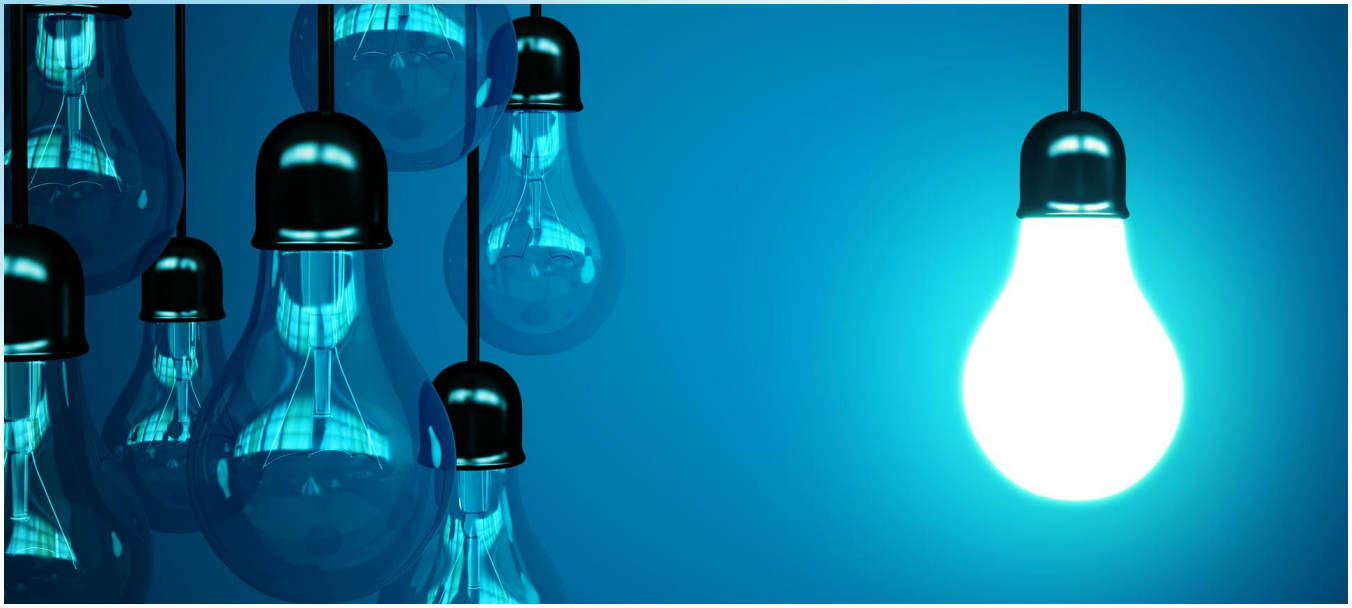
Approach: Inductive Potential Zones and Grounding Training

- During fault conditions:
  - When troubleshooting a line, it is necessary to identify whether electric potential is coming from induction
  - Induction from nearby transmission lines can lead to non-zero potential which is hazardous to linemen and a wildfire risk
- Enhance training through simulation:
  - Assure linemen grasp the concept of induction
  - Teach and practice the required work methods before linemen work on energized lines
  - Assure use of safe practices and procedures

Approach: Equipment Inspections and Corrective Actions

- SDG&E uses overhead simulators -- 3D in a web platform
- Underground simulators would be highly beneficial for teaching safe practices
- Augmented reality in training simulators not a must; it's an option to be considered

Discussion



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EPIC-3, Project 5

Unmanned Aircraft Systems with Advanced Image Processing for Electric Utility Inspection and Operations

SDGE
A Sempra Energy utility®

Tom Fries

November 9, 2018

Background

- As technology has advanced in the Unmanned world, we have found there to be many different sensors that could be used within the utility to provide proactive & preventative maintenance.
- As we look into other sensors and the data provided from the sensor, we have now ran into the hurdle of large data sets and storage.

Objectives

- Demonstrate new applications of unmanned aircraft systems (UAS) with enhanced image processing capabilities for electric utility operations.
- Define, demonstrate, and evaluate concepts for instrumentation and monitoring of power system equipment, using enhanced imaging on UAS and sensor technology.
- Evaluate the potential to increase reliability, safety, and cost efficiency to improve power system operations.

Approach

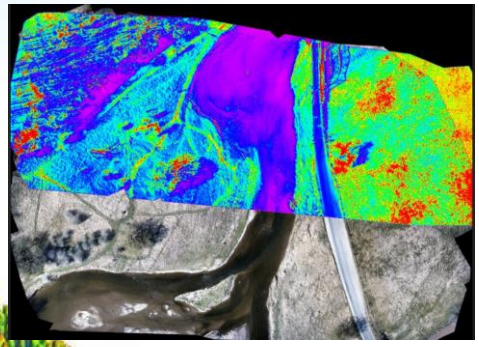
- **Big Data**
  - Where to store?
  - How to store?
  - What format?
  - How to apply Artificial Intelligence?

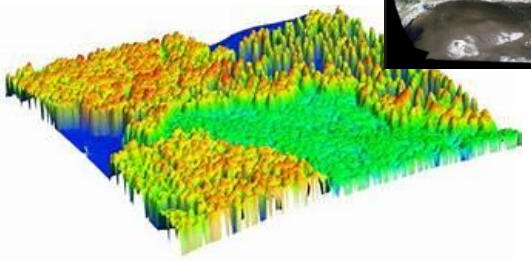
Approach

- Looking for sensors that can provide the following:
  - Multispectral
  - Coronial (UV)
  - Infrared (IR)
  - Autonomous Flight with accurate elevations and sense-and-avoid tech

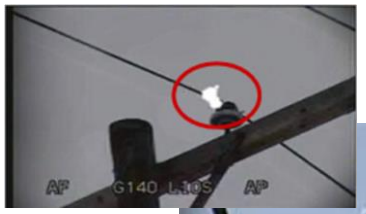
Approach

- **Multispectral**
  - Using the UAS with a Multispectral sensor can help detect the health of the vegetation around our infrastructure.





- **Coronial (UV)**
  - UV sensors can detect coronial discharge that stem from natural wear, environmental factors such as temperature variations and contamination from its surroundings.



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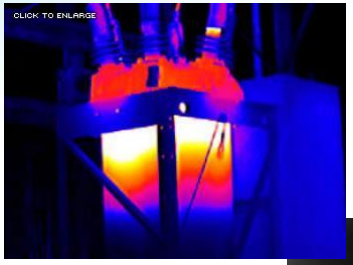
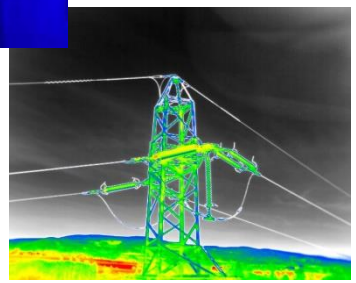
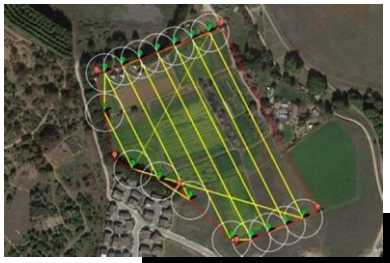
Approach

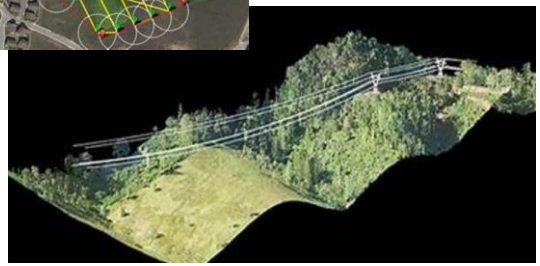
- **Infrared (IR)**
  - Infrared electrical inspections find excess heat caused by defects in connections and components.





- **Autonomous Flight**
  - Autonomous flight paths are used to ensure photos are taken at the best angel and proper data is collected.





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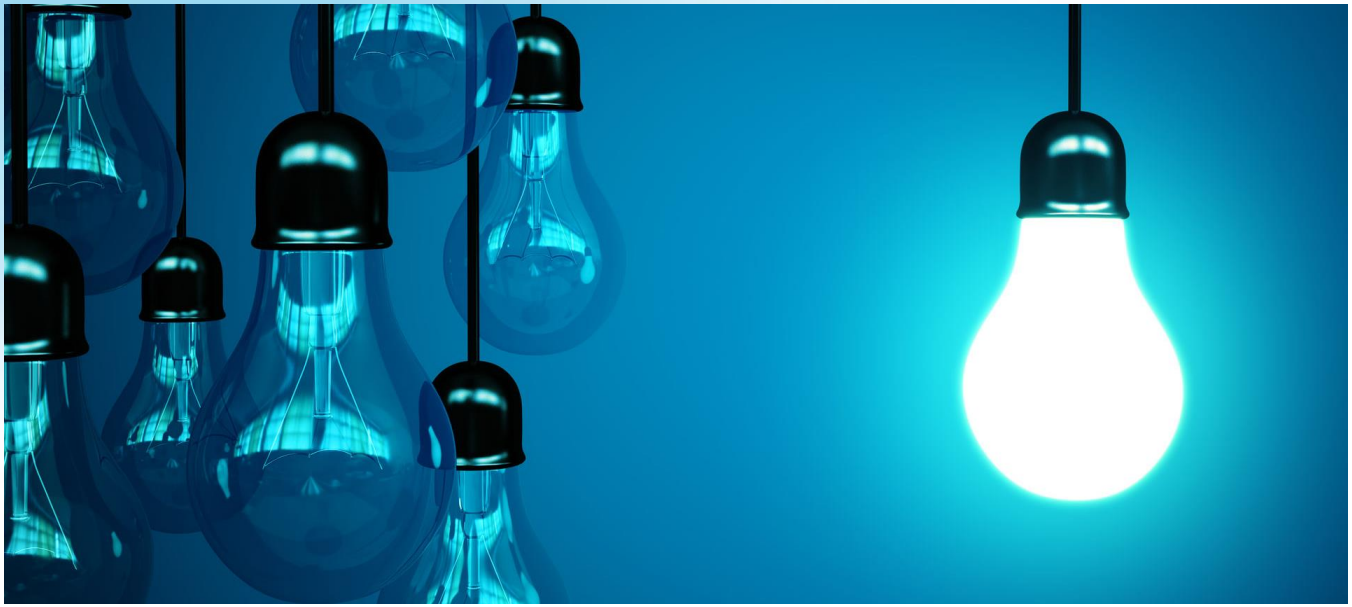
Discussion



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