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
Please tell us what you think!
EPIC-3, Project 5

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

Tom Fries
November 9, 2018
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.
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.
Discussion

*Please tell us what you think!*