IEEE PES Transformers Committee
Fall 2023 Meeting
Kansas City, Missouri

IEEE Standard 1402:
IEEE Guide for Physical Security of Electric Power Substations

— Technical Presentation —
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1. Abstract

On April 16, 2013, the Metcalf substation, south of San Francisco, was attacked with rifles. As a result of the attack, 17 transformers were put out of service and power had to be rerouted to avoid a black-out. The attack caused $15 million in direct damages and caused 52,000 gallons of oil to be spilled. Unfortunately, the perpetrators were never caught. In summary, a ranking member of the United States House Committee on Energy and Commerce stated that the attack was "an unprecedented and sophisticated attack on an electric grid substation." The aim of this tutorial will be to give an introductory insight into the "puzzle" of substation physical security and introduce attendees to the guidance available in IEEE Standard 1402.

2. Learning Objectives

This tutorial provides opportunities to learn about the following:

- Overview of substation physical security needs
- Introduction to and brief history of IEEE Standard 1402
- Introduction to the process of physical substation security hardening, including lessons learned and best practices

3. Learning Outcomes

By attending this tutorial, attendees will gain an understanding of the following:

- Guidance provided in IEEE Standard 1402
- Main concepts underlying substation physical security, including:
  - How to assess threats to substations
  - Key factors to consider when designing threat mitigation measures
  - Planning for physical security
  - How to analyze the design of a physical security system

4. Presenters' Biographies

Connor Bowen is a structural engineer at Burns & McDonnell with over nine years of experience working on substation projects across North America. His primary responsibilities include the design of structural steel and connections, concrete foundations, rigid bus modeling, oil containment systems, storm water management systems and site grading for substation projects. He has been active in participating in IEEE committees as well as CIGRE and ASCE events related to the T&D industry.

Isaac Cowger is an electrical engineer and project manager who leads and manages substation design teams for physical security, physical design, protection and controls and system impact and facility studies for Burns & McDonnell. His 14-year experience involves designing substations ranging from 4.16kV to 230kV and the design of security upgrades at substations at 500kV and below. Prior to joining Burns & McDonnell, Isaac was a member of the United States Army Special Forces as a Green Beret for eight years.

Mark Smedvig is currently the substation business line manager for the Burns & McDonnell Dominion Energy account and has been serving the T&D industry almost 15 years as a structural engineer and project manager. Following the sniper attack at Metcalf Substation in 2013, Mark was brought in to help Dominion Energy respond to NERC CIP 014 evaluations and to establish new substation security standard designs. Since that time, Mark has helped various utilities establish standards and has completed substation security projects at over 70 sites, with scopes spanning from conceptual design to full EPC project execution. Mark is also active in T&D professional organizations, including serving as vice chair for the recently published guide, IEEE 1402 Guide for Physical Security of Electric Power Substations. His experience in both substation design and physical security design provides a unique perspective to the security conversation within electrical substations.