

Vulnerability Assessment of Electricity Distribution Networks

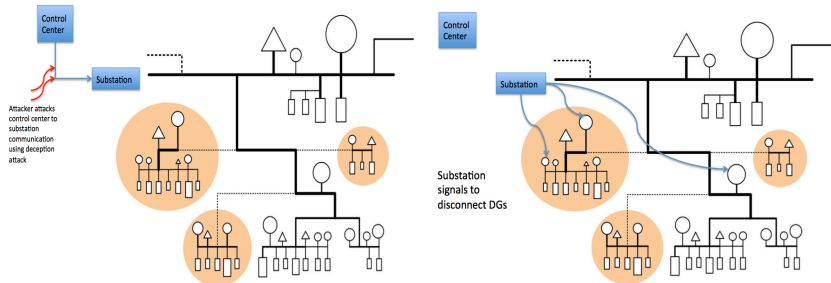
Devendra Shelar and Saurabh Amin
Massachusetts Institute of Technology

Joint work with Bruno Prestat (EPRI/EDF) and John McDonald (EDF)

Vulnerability assessment

An example NESCOR scenario

DGs are shutdown by spoofed SCADA control commands



Challenge

How to assess vulnerabilities for worst-case attacks?

Distribution network and IT system co-simulation

Objectives

- ▶ Compare ICT Security Architecture & Strategies
- ▶ Attacker's objectives: loss of load, voltage regulation, equipment damage
- ▶ Minimize the impacts of incidents on power system

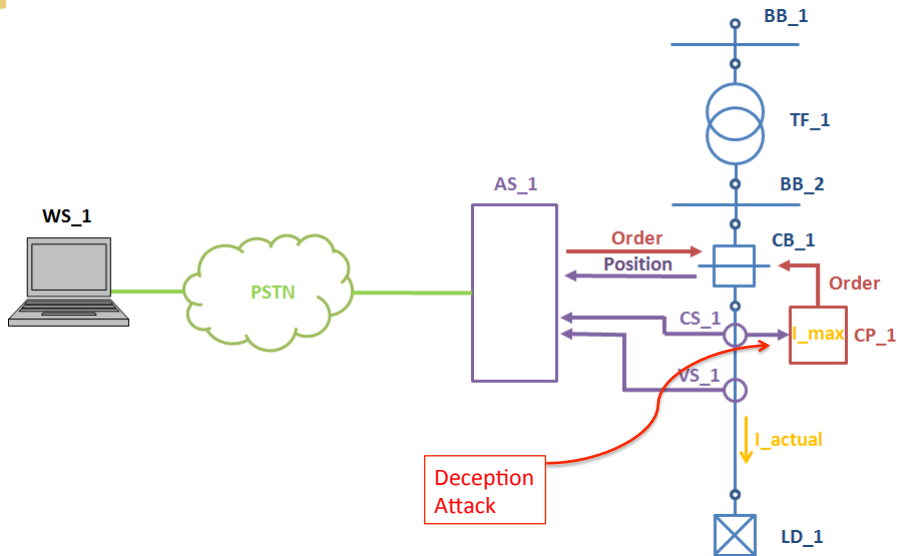
Collaborative effort

- ▶ EPRI has supplied use cases and scenarios

Scope

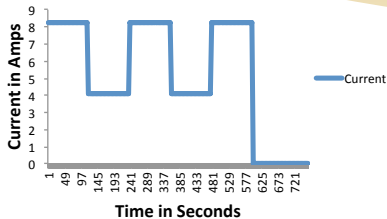
- ▶ Physical: Actors, topology, models; Interfaces with transmission; Integration with PV and wind farms
- ▶ Cyber: Communication network topology, protocols; IEC 61850-based implementation of substation and control center communications

Use case - One MV Load, Simplified MV Substation

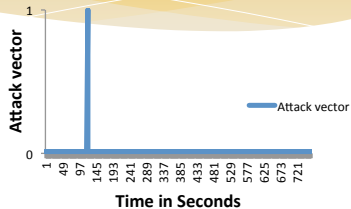


Co-simulation results

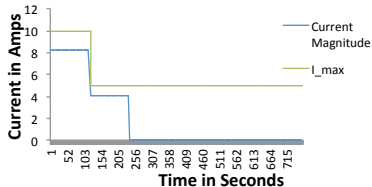
Current vs Time When No Attack



Attack vector vs Time



Current and I_max vs Time



State of the Circuit Breaker

