Lifelines & Utilities – Southern California Edison

“Keeping the Lights On”

Florizel R. Bautista, PE – Supervising Engineer, Substation Structural, SCE
Dr. Dennis Ostrom, Ph.D, PE – Retired SCE Engineer

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Impacts – SCE Power System

- SCE customers lost power on the Ventura Plane
- Approx. 600,000 – Ventura
- Approx. 225,000 – Santa Clarita Valley
- Ventura Plane outages due to combination of regional power isolation caused by damages at Pardee Substations
- Santa Clarita outages due to damages at Saugus Substation
Impacts – Pardee Sub. Damages

- Damaged equipment (Circuit Breakers, Disconnect Switches, Insulators, CCVT, bushings, etc.)
- Damaged steel support structures
- Damaged transmission towers outside of substation
- Damaged foundations for Transmission and Substation equipment/structures
- Presence of cracks in the control building walls and basement
Images of Pardee Sub. Damages
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Images of Saugus Sub. Damages
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Service was restored within 24 hours by:

- Edison personnel worked under emergency condition
- Bypassing damaged equipment
- Obtaining parts from the Spare stocks located on other SCE facilities/substations to replace damaged components
Images of Restoration Effort:
OUTCOMES - Moving forward to Operational Excellence

- Focus to assure equipment performs to a high seismic level using more stringent qualification criteria (IEEE 693)
- Support Structures being designed to accommodate the high seismically-qualified equipment
- Site (fabrication and construction) inspections have been strictly implemented assuring the quality and workmanship of the material and equipment
SCE Equipment Design Spectrum
OUTCOMES - Moving forward to Operational Excellence

- Created a Business Resiliency program to emphasize long-term planning preparation and immediate response to major catastrophic event
- Enhancing the inventory of Spare equipment strategically located within or close proximity to major Substation facilities
- Collaboration with external organization (Caltech, USGS, etc.)
Collaboration with other Utilities to promote uniformity and mutually acceptable procedure

Inter Utilities Working Group (IUWG)

Our E&TS Substation Structural Engineering Group pioneered the Inter Utilities Working Group (IUWG) which is a joint effort among utility companies within the Western region. Since 2011, the IUWG has been the medium in:
- Sharing engineering knowledge
- Discussing and solving common issues pertaining to structures and equipment
- Working toward standardization of electrical utility practices such as the development of a new AISC 113 Substation Structure Design Guide

“Together We Build The Future”

Los Angeles Department of Water & Power
Bonneville Power Administration
Southern California Edison
PG&E
SDG&E
Sempra Energy Utility
PacifiCorp
Recommendations

- Continuous R&D to qualify equipment to high seismic level
  - Shake table testing
  - Improve installation procedure (conductor slack, isolators, etc.)

- Conduct simulation of system earthquake performance
  - Using risk assessment methodology
  - Identify fragilities in the system
  - Formulate counter-measures and recovery strategies