

## Final Project Summary — PEER Lifelines Program

<b>Project Title—ID Number</b>	<i>Database of Seismic Parameters of Equipment in Substations—413</i>		
<b>Start/End Dates</b>	3/1/03 – 3/31/04	<b>Budget/ Funding Source</b>	\$35,250 / PG&E
<b>Project Leader (boldface) and Other Team Members</b>	<b>Ostrom (D. Ostrom Consulting)</b>		

### 1. Project goals and objectives

Electrical substations consist of many pieces of equipment that are vulnerable to earthquakes. Vulnerability depends on a variety of parameters including equipment type, voltage, manufacturer, seismic design criteria, installation and anchorage, foundations and soil conditions, and connection to other equipment. In order to be able to make accurate and standardized estimates of potential losses in earthquakes and to set priorities for equipment upgrades and replacements, an accurate database of the relevant seismic-performance parameters of substation equipment is needed. In this project, a comprehensive procedure for compiling seismic performance parameters of critical electrical components was developed and documented. The experience gained in assessing seismic vulnerability of substation equipment in previous PEER Lifelines Program research was incorporated.

### 2. Benefits of the results of this project to develop technologies and protocols to mitigate the vulnerability of electric systems and other lifelines to damage directly and indirectly caused by earthquakes. Also, benefits to develop assessment techniques to evaluate damage to electric systems caused by earthquakes and to assess fiscal impacts due to the loss of electric service to the community.

Development of a comprehensive procedure for compiling seismic performance data of electric substation equipment that is tied to a network-based earthquake loss estimation methodology will enable accurate and standardized estimates of potential losses to electrical systems in earthquakes and set priorities for equipment upgrades and replacements.

### 3. Brief description of the accomplishments of the project

Documentation of substation equipment performance data base.  
 Documentation of substation equipment installation and connectivity data base.  
 Creation of hypothetical electrical system and its equipment data documentation  
 Sample simulation run and data results of a hypothetical electrical system to a single earthquake scenario

### 4. Describe any instances where you are aware that your results have been used in industry

No System Earthquake Risk Assessment (SERA) of the nature that is contained in this work has been done on an electrical system since this project was completed. This work is that documentation and extension of previous work that was done at Southern California Edison in the 1990s.

### 5. Methodology employed

Document

### 6. Other related work conducted within and/or outside PEER

This work is an extension and documentation of the SERAs that were done on SCE in 1990 and 1998 and EBMUD in 1993.

### 7. Recommendations for the future work: what do you think should be done next?

Develop more complete equipment performance data and improve the loading metrics on which the electrical system performance is based.

Develop system performance metrics  
Develop Return-to-service algorithms  
Combine MCEER system “return to service” work with PEER “system performance” work and conduct full SERA on hypothetical system.

**8. Author(s), Title, and Date for the final report for this project**

**Author: Dennis K. Ostrom**

**Title: Database of Seismic Parameters of Equipment in Substations**

**Date: June 30, 2004**

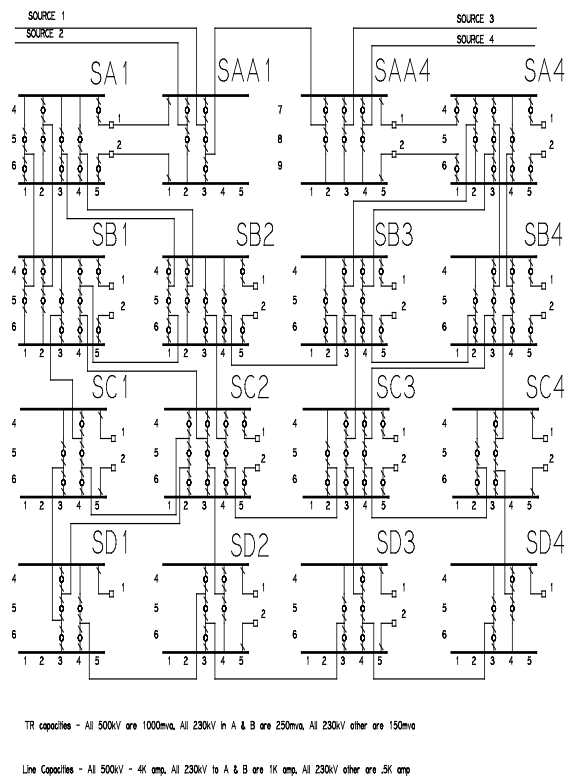


Figure 4-1 – Hypothetical System Single Line Drawing.