TIP 25a: EPRI P37 Supplemental: Substation Seismic Studies

Context

The Institute of Electrical and Electronics Engineers (IEEE) Standard 693, Recommended Practice for Seismic Design of Substations, is used by electric power utilities to qualify substation equipment for seismic events.

Deficiencies exist in the present standard, and information is unavailable for dynamic response that may be used to provide better seismic qualification procedures in the IEEE 693 Standard. Representatives from utilities that had participated in the IEEE 693 Working Group, as well as several other utilities, formed a consortium under EPRI to participate in collaborative projects to address these deficiencies.

Description

EPRI conducts testing under the governing standard, IEEE 693-2005, with modifications that are deemed appropriate. In general, the input motions, instrumentation, test sequences, functional tests, and other requirements specified by the referenced standard are used. Recently recommended standard improvements are used to the extent possible.

Each item of equipment is expected to undergo tests required by IEEE 693-2005, with modifications as determined by the EPRI Technical Manager, with input from the participants.

Representatives from each participating utility form the governing body (under the direction of EPRI) for the project. Testing is performed at appropriate test facilities as directed by EPRI, with input from the participants. The project is managed by an EPRI manager. Technical services are provided by the EPRI Technical Manager. The project addresses the deficiencies in the present standard, especially those related to details left unspecified, by performing tests in the laboratory.

EPRI selects the item(s) of equipment that is (are) to be tested for each year. EPRI establishes equipment support structure specifications and vibration test requirements, electrical equipment specifications, and test specifications. EPRI also will select a vibration testing facility (and electrical testing laboratory, if required) to perform tests and draw a contract for laboratory services.

The EPRI Technical Manager prepares a Request for Proposal and issues it to equipment manufacturers. Equipment manufacturer(s) are then selected to participate in the project. The Technical Manager prepares a test plan in conjunction with the testing laboratory and the equipment manufacturer. The testing laboratory performs qualification tests on one or more items of equipment under the overview of the Technical Manager. The manufacturer and testing laboratory prepares qualification documentation for the equipment that qualified as following IEEE 693 requirements. The Technical Manager then prepares a project report describing the project.

Why It Matters

Among the benefits this project offers are:

- Data to engineers to specify seismic requirements adequately for substation equipment
- Provide seismic qualification procedures to engineers to qualify substation equipment
- Provide a better understanding of the seismic performance and vulnerability of high voltage substation equipment
- Improve survivability of substation equipment and minimize its damages during earthquakes

The project addresses deficiencies in the existing standard that evaluates performance of substation equipment, to ensure that qualified products will have higher probability of surviving earthquakes. As a result, both repairs of damaged equipment and power interruptions will be reduced, thus enhancing continuity of power supply to the public and lowering operating costs of electric power utilities. As stated in IEEE 693, equipment qualified using the recommended practice should "perform acceptably under reasonably anticipated strong ground motion."

Goals and Objectives

An important part of the project is to determine what deficiencies exist in the present standard, especially those related to details left unspecified. Tests are performed by a laboratory to gather dynamic response information that may be used to provide better seismic qualification procedures in the IEEE 693 Standard, IEEE Recommended Practice for Seismic Design of Substations.

TIP 25a: EPRI P37 Supplemental: Substation Seismic Studies

Project Start Date: January 1, 2012

Project End Date: December 31, 2014

Reports & References (Optional)

Links (Optional)

Funding

BPA FY2014 Membership: $35,000

For More Information Contact:

BPA Project Manager:
Leon Kempner, lkempnerjr@bpa.gov

Participating Organizations

EPRI
PG&E
SDG&E
WAPA
Transpower
NY Power Authority
NY ConEd