ERNEST ORLANDO LAWRENCE
BERKELEY NATIONAL LABORATORY

**Environment, Health, & Safety**
**Training Program**

# EHS 0570 QEW Capacitor Safety
## Course Syllabus

**Subject Category:** Electrical Safety

**Course Length:** 4 hours
**Delivery Mode:** Classroom

**Course Prerequisites:** EHS 0370, EHS 0538 (QEWR), EHS0540 – EHS 0542 (QEW1), EHS0550 – EHS0554 (QEW2)
**Medical Approval:** None
**Frequency:** Every 3 years

**Course Purpose:**
This course builds upon the work covered in previous QEW training, applying ISM and specifically addressing Electrical Hazards and safety controls for Qualified Electrical Workers when working with Capacitors.

**Course Objectives:** Upon completion of the course the student should be able to:

- Implement the electrical safety requirements of LBNL ESM section 15.
- Explain the hazards related to capacitors, including fibrillation, arc flash, acoustic and short-circuit hazards.
- Explain how to analyze electrical hazards in capacitors:
  - RC charge/discharge circuit
  - Equivalence capacitance (parallel, series)
  - Capacitance in a length of cable
  - Capacitor hazard labeling
  - Determining the correct voltage to be used for electrical hazard analysis
- Calculate the following:
  - Stored energy in joules
  - Time constant
  - Discharge time to non-hazardous voltage (<50V)
  - Peak current and power
- Selecting appropriate PPE and work controls, including requirements for LOTO:
  - Complex LOTO
  - Discharging with a stick
  - Measuring residual voltage
  - Soft grounding vs. hard grounding (low-Z, high-Z)
  - Explain why bleed resistors cannot be trusted
- Proper storage, handling, labeling and disposal.
- Assist non-QEW personnel.

**Subject Matter Expert:** Mark Scott, Stephanie Collins

**Training Compliance Requirements:** LBNL Electrical Safety Manual, EHS Safety Manual (formerly PUB-3000)- Chapter 8, *Electrical Safety Program,* 29CFR 1910.147, 29CFR 1910.333, NFPA 70E

**Course Instructional Materials:** PowerPoint presentation and video

**Web Resource:** http://electricalsafety.lbl.gov/