

## Electrical Testing

# ENSURING NUCLEAR SAFETY AND RELIABILITY

Testing of the high-current and high-voltage electrical equipment at nuclear power plants is critical to minimizing the potential for electrical faults and short circuits that could lead to fires, equipment damage, and extended downtime.

### CHALLENGE



#### MINIMIZING ELECTRICAL HAZARDS

Transformers, circuit breakers, and batteries are some of the high-voltage and high-current electrical equipment that can generate or mitigate large fault currents at nuclear power plants. High-energy faults and short circuits can cause fires resulting in the loss of costly equipment and facility damage.



### BROOKHAVEN LAB SOLUTION



#### ELECTRICAL ACCEPTANCE TESTING

Brookhaven Lab's Superconducting Magnet Division test facility can generate the electrical operating conditions that are relevant to nuclear power plants. Testing performed in this facility can provide assurance that the electrical equipment can withstand abnormal conditions that may arise during regular or emergency operations.

Two recent tests sponsored by the Nuclear Regulatory Commission were conducted with division equipment. In 2016, equipment to perform quench tests of superconducting magnets (quenching refers to the sudden loss of zero-resistance transmission) was used to determine that an open circuit on the secondary circuit of a current transformer commonly used in alternating current (AC) power distribution systems at nuclear plants could not cause secondary fires, such as those following a power surge.

In another test, short-circuit conditions were simulated to determine the timing associated with the fault current generated by parallel operating batteries and battery chargers used to supply emergency power in the event of an AC power loss. The test results are being used to revise an Institute of Electrical and Electronics Engineers Standard (946) that provides guidance to the nuclear industry on these matters.



## WORK WITH US

As part of its pursuits in fundamental and applied research, Brookhaven National Laboratory, which is located approximately 60 miles east of New York City on Long Island, partners and collaborates with public and private entities, including other federal agencies and national laboratories, academia, and industry—including small businesses and major corporations.

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## DIVERSE EXPERTISE

Brookhaven Lab conducts research involving physical and environmental sciences, energy technologies, and national security, which includes

Nuclear Energy Technologies

Energy Storage Solutions

Material and Chemical Sciences

Computational Science and Data Analytics

Climate and Atmospheric Sciences



## RESEARCH FACILITIES

The Superconducting Magnet Division at Brookhaven National Laboratory designs and fabricates superconducting magnets for use in both particle accelerators and experimental facilities, including the Relativistic Heavy Ion Collider at Brookhaven Lab and the Large Hadron Collider at CERN in Europe. Its capabilities include

Various AC- and direct current (DC)-controlled power sources, ranging from 480 volts and 1600 amps for AC to 30 volts and 30,000 amps for DC

State-of-the-art high-speed multichannel data acquisition systems with a sampling frequency of up to 1 MHz and 16-bit resolution

Equipment to perform specialized testing, including isolation and buffer amplifiers for high-voltage measurements, voltage and current transformers, high-current controlled switches and circuit breakers, and a deionized water supply for cooling load banks

<https://www.bnl.gov/nst/>



## CONTACT

**Kathleen Amm**  
Division Head

Superconducting Magnet Division  
ammk@bnl.gov | (631) 344-6150  
P.O. Box 5000, Upton, NY 11973-5000

