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Title: Critical Experiments and Hands-On Training Course at Sandia National Laboratories Critical Experiments Facility (SCX)

Critical Experiments have developed crucial data for the nuclear industry. In the early days, the experiments provided the basis for determining critical masses of nuclear material, which contributed to the development of the nuclear weapons. This knowledge then transitioned into information utilized for computational method development. The many different codes require the critical experiment data to validate and verify that the nuclear physics have been adequately represented in the code. Today we develop critical experiments for the same purpose.

Sandia National Laboratories currently has the Seven Percent Critical Experiment (7uPCX) with the initial purpose of providing reactor physics and criticality safety benchmark data for the uranium enrichment of 7 wt%. These data will contribute to the effort to raise the enrichment level in the US commercial light-water reactor above the current 5 wt% limit. However, this mission of the SCX has expanded. In addition to the benchmark data, the experiments are used to teach a two-week hands on criticality safety training course for Nuclear Criticality Safety Engineers and a one-week course for nuclear material managers. The first course provides the necessary hands-on training for Nuclear Criticality Safety Engineers to complete their qualification. The second course exposes nuclear material handlers and managers to the processes involved in developing nuclear criticality safety limits.

The students in both courses participate in 4 experiments: an approach-to-critical on fuel mass, an approach-to-critical on water height, an approach-to-critical on the separation of two fuel masses, and an approach-to-critical on water holes. In addition to the experiments the students receive a background of information that allows them to better understand the physics and nuclear criticality safety methods and terms. One of the most important lectures discusses the different parameters that effect criticality safety: MAGIC MERV. The lectures and experiments have been selected to provide the students with a comprehensive overview of criticality safety practices that will be key to their success in the field of Nuclear Criticality Safety.