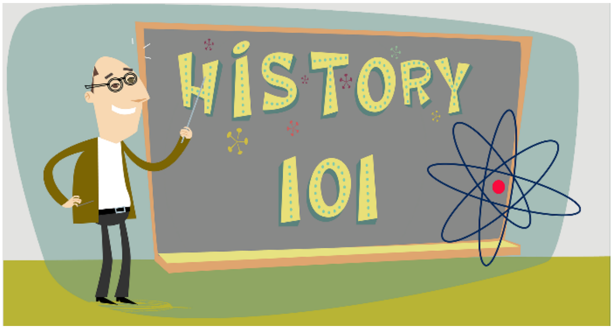
Part II: Ensuring Safety in the First Temple of the Atom



As noted in Part I of this story on the NC State research reactor, the Atomic Energy Commission was very anxious to promote the world's first civilian reactor. But its enthusiasm was tempered by the challenge of placing a reactor safely on a busy college campus and developing an approval process for non-AEC reactors.

The AEC turned to its Reactor Safeguard Committee, the forerunner of today's Advisory Committee on Reactor Safeguards. The Committee was formed in 1947 to evaluate the safety of new reactors proposed by AEC laboratories and contractors. "The committee was about as popular—and also necessary—as a traffic cop," recalled Safeguard Committee Chairman Edward Teller.

The Committee's most significant contribution was establishing a conservative approach to safety given the engineering uncertainty of that era. "We could not follow the usual method of trial and error," Teller said. "The trials had to be on paper because the actual errors could be catastrophic." The Committee developed a "simple procedure" of challenging a reactor designer to write a "hazard summary report" that imagined the worst "plausible mishap"—soon known as a "maximum credible accident"—and demonstrate the reactor design could prevent or mitigate it.

The Committee focused on several hazards, including a surge in the chain reaction called a reactor "runaway," a catastrophic release of radioactive material from fire, sabotage, or an earthquake, and hazards from routine operation that might result from leaks or inadvertent exposures. The Committee asked NC State to address these concerns in a "hazards summary report."

To meet the Committee's desire for inherent safety, NC State proposed a "water boiler" reactor, which was believed to have "student-proof" safety margin given its strongly "negative coefficient" of reactivity that limited greatly the possibility of a runaway. NC State also developed interlocks and an extremely dense concrete shielding to discouraged sabotage.

In order for NC State to commit the funds to such a long-term project, it needed an early approval. This created a dilemma since the college did not yet have a detailed, complete design. The AEC used a two-step conditional approval that was similar to its later construction permit/operating license process. In step one, construction did not begin until NC State addressed the most important design safety issues. When it did, the AEC agreed by contract to supply enriched fuel. The fuel was not delivered, however, until NC State resolved all outstanding safety questions and a final inspection took place. With that, the first civilian reactor in history went critical in September 1953.

The AEC approach to safety at NC State foreshadowed many later regulatory practices. As important as the 1954 Atomic Energy Act is to current regulatory practice, it is interesting to see that many of the critical elements have even deeper roots back toward the beginning of the atomic era.

By Thomas Wellock, NRC Historian