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Safety of warhead-related tests at Livermore lab challenged

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Livermore scientists at the multibillion-dollar National Ignition Facility have begun a series of controversial experiments zapping tiny samples of the intensely radioactive element plutonium with powerful laser beams.

The nature and safety of those experiments are under challenge by local and national environmental organizations, but leaders of the research insist the tests are safe and essential to assure the "safety, security, and reliability" of the warheads in America's nuclear weapons stockpile.

Plutonium, a manufactured element, was the explosive ingredient of the atom bomb that destroyed Nagasaki in World War II, and is the essential key to the far more powerful hydrogen bombs now held in America's nuclear arsenal.

The new experiments are aimed at making sure that the thousands of nuclear weapons stockpiled for decades in the nation's arsenal are still in working condition.

Opponents argue that the Lawrence Livermore National Laboratory's assurances on safety of the experiments are inadequate, and charge that the lab's most important environmental impact statement on experiments conducted there is 10 years out of date and grossly inadequate.

Lawrence Livermore lab

Tri-Valley Cares, the environmental organization based in Livermore, and the Natural Resources Defense Council in Washington have called for a halt to the experiments and for a new environmental impact statement before any work with plutonium continues.

The huge facility known as the NIF, with its 192 immensely powerful lasers, was completed at the Livermore lab campus in 2009, and at the time was hailed as a potential source of benign and unlimited energy. It would safely tame the violent nuclear fusion reactions of the sun and the stars in the laboratory, they predicted.

The NIF's promised goal of achieving "ignition" — creating far more energy than the facility would consume — has never been reached. Its original budget of $1.1 billion has officially swelled to $3.5 billion, although former lab leaders say the costs have reached more than $5 billion.

Mike Dunning, director of the lab's plutonium project known as the Primary Nuclear Design Program, said experiments with the dangerous element have always been planned as part of the NIF's mission.

"These are relatively simple experiments," Dunning said, "and there is a very robust radiological safety program in place."

Technicians at the NIF have run two plutonium experiments since January, and two more are scheduled this year, he said.

Experiments will be conducted “until we’ve answered all the questions,” he said. That could be as many as 120 experiments in total, earlier plans showed.

Plutonium zapped

Plutonium exists in many forms known as isotopes. The extremely radioactive “weapons grade” isotope used in nuclear weapons is plutonium-239, but Dunning said the experiments will involve only plutonium-242, which is radioactive, but much less so than the isotope used in bombs, and is much simpler to handle.

In the current round of experiments known as “shots,” tiny wafers of plutonium-242, measured in microns or millionths of a meter — are coated with layers of carbon, aluminum and gold and then squeezed and heated inside the NIF’s target area under the tremendous pressures created by simultaneous bursts of energy from 16 of the NIF’s 192 laser beams. At the same time, another 24 lasers generate a pulse of X-rays that enable scientists to observe structural changes in the plutonium when it is being squeezed as if it were inside an exploding atom bomb.

Those experiments are necessary to help validate computer models about the safety and reliability of the nuclear weapons in the stockpile, the specialists say.

Exactly how plutonium behaves during the heat and pressure of a nuclear explosion has never been clear to scientists, and making sure that the unstable element would still trigger weapons after a long time in storage could only otherwise be tested by underground nuclear explosions — which have been banned by treaty since 1996.

A complete environmental impact statement for the Lawrence Livermore National Laboratory first approved the safety aspects of the plutonium program in 2005, said Sandra Brereton, the lab’s deputy principal associate director for operations. It was approved after a second review of the program in 2011, Brereton said. In November last year, still another safety review committee approved the program before the experiments were to start, she said.

Containment questioned

Marylia Kelley, executive director of Tri-Valley Cares, and lawyers for the nuclear watchdog organization have been a thorn in the side of the Livermore weapons lab and the NIF for decades, and are using every possible weapon to stop the plutonium experiments.

The lab’s original plans for the current round of experiments indicated “shots” would be surrounded by an effective inner containment vessel placed for safety inside the target chamber, where the lasers must focus to vaporize the plutonium, Kelley said.

But her organization’s filings under the Freedom of Information Act have revealed that the shots will take place without an effective inner containment vessel to capture plutonium debris, she said, and would generate illegal levels of airborne contamination.

Among many other major concerns, Kelley said, are that weapons-grade plutonium could be mixed into some of the later experiments, and that if accidents occur, airborne concentrations of plutonium could exceed safe levels. The issues are enough, she said, to require stopping the experiments until strong new safety standards are in place.

More than 190 nations have signed the Non-Proliferation Treaty of 1968, designed to prevent the spread of nuclear weapons and weapons technology. The United States is among them.

"Conducting plutonium shots in the NIF poses a serious, long-term threat to U.S. nonproliferation objectives abroad," Kelley said. "It will certainly worsen underlying tensions in the nonproliferation regime, and may do permanent damage."

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