

# Subcritical Nuclear Tests Raise New Dangers

Thursday, May 2, 2019

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On February 13 of this year, Livermore and Los Alamos Labs conducted a subcritical nuclear test in Nevada that breached the steel containment vessel that was supposed to contain it. One month later, on March 12, the decontamination of plutonium in the underground chamber was completed. Soon thereafter, the Trump budget request for the coming year was released. It includes no information about the subcritical release incident but is chock full of funding to conduct more frequent subcritical tests while enhancing the types of equipment that can be used in their detonation.

The accident involved cracks in the fasteners on the containment vessel. It illustrates one obvious danger with these experiments, radioactive contamination. The subcritical test program also creates less obvious risks to national and global security norms and treaties. These dangers are illuminated in the National Nuclear Security Administration (NNSA) budget request for nuclear weapons activities.

As Tri-Valley CAREs reviewed the NNSA request for Fiscal Year (FY) 2020, we noticed a growing budget item, "Enhanced Capabilities for Subcritical Experiments," along with a plan for an increased "cadence" of subcritical tests.

Subcritical tests are explosive experiments conducted in an underground chamber at the Nevada Nuclear Security Site, previously known as the Nevada Test Site where more than a thousand above and below ground nuclear tests were detonated before 1992, when the nuclear testing moratorium act was signed into law.



One of two experimental alcoves in the 102 minicomplex during construction. Workers are installing the utilities required to stage and diagnose subcritical tests.

Subcritical tests use weapons grade plutonium, but the small amounts involved do not reach a self-sustaining "critical" fission chain reaction, or nuclear explosive yield. Tri-Valley CAREs and others have raised objections to subcritical experiments and their role in new weapons development. Further, while subcritical tests may not technically violate the Comprehensive Nuclear Test Ban Treaty, which the U.S. has signed but not ratified, the tests undermine the spirit of the treaty.

Subcritical tests along with the entire nuclear stockpile stewardship program enable the Trump Administration to ratchet up the pace and scope of developing new warheads alongside its plan to also expand production of plutonium bomb cores, called “pits,” for the new warheads. At least one new warhead, the W87-1, will require a pit that differs from previous designs.

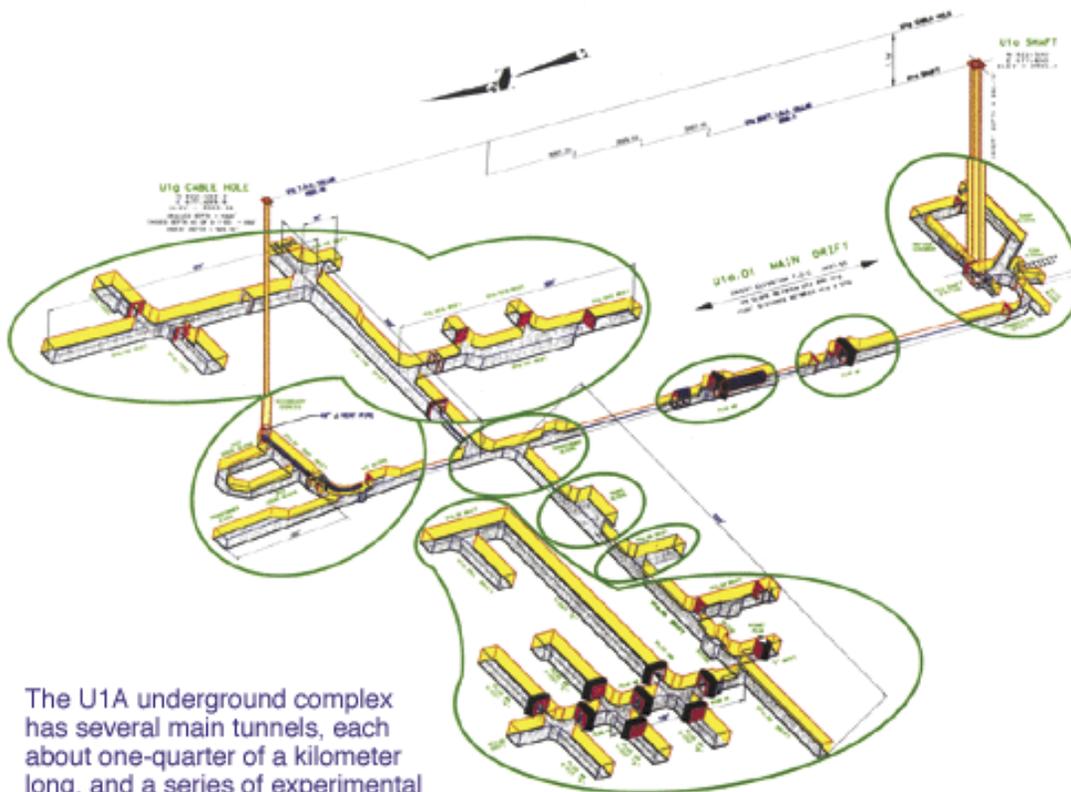
Taken together, these activities that make changes to weapons create pressure to consider resumption of nuclear explosive (i.e., yield) testing in order to certify them. In the context of plans for new nuclear weapons, it is not surprising that the NNSA is enhancing its subcritical testing program. However, the program is dangerous and warrants more scrutiny.

### Enhancing Subcritical Capability and Cadence

The ramp up in subcritical testing is called “Enhanced Capabilities for Subcritical Experiments” (ESCE) and it includes developing new diagnostic tools for these tests and more. The NNSA FY20 budget request traces the evolution and projected growth of the ESCE program – and it is instructive.

NNSA first notes the justification that “*the stockpile is inherently moving away from the Underground Test (UGT) database through aggregate influences of aging, modern manufacturing techniques, modern materials, and **evolving design philosophies***” (emphasis added; in plain language this means novel designs and new military capabilities).

Then the history is traced back to 2014 when both Los Alamos and Livermore labs, “*jointly identified that a capability gap exists.*” After further studies in 2016, NNSA claims that it was determined that, “*Enhanced Capabilities for Subcritical Experiments (ECSE) will close this gap.*”



The U1A underground complex has several main tunnels, each about one-quarter of a kilometer long, and a series of experimental areas. Both Lawrence Livermore and Los Alamos have designated areas in which to perform subcritical tests.

Further, NNSA notes in its new FY20 budget request that “**Data from ECSE will help the certification of the W80-4 LEP and the W87-1 Modification Program,**” (emphasis added) and that, “to support the program plan documented in the 2018 Stockpile Stewardship and Management Plan (SSMP), NNSA places a high priority on developing ECSE.”

The W80-4 and W87-1 warheads are both being developed at Livermore Lab and the so-called “evolving design philosophies”

are hugely in evidence here. Weapons designers and others in government have told us that Livermore's design for the W80-4 is becoming increasingly more novel and complex (hence the need for additional types of diagnostic tests in ECSE along with more frequent subcritical tests). The W80-4 warhead will be mated to a new air-launched cruise missile being developed by the Pentagon.

The W87-1 is a new warhead design that will require a new-design pit among other new components. These features will push the warhead to "need" ESCE. An additional danger is that the warhead's novelties may ultimately push beyond ESCE's boundaries and lead to conducting nuclear explosive yield testing in order to certify the new design. The W87-1 is intended to be mated to a new intercontinental ballistic, land-based, missile that has not yet been developed.

While NNSA and the weapons labs are pressing to enhance the subcritical testing program, and the Trump Administration is fully on board, congressional support for the ESCE program has so far been less enthusiastic. The FY 2018 budget request of approximately \$51 million fell to \$40.1 million in the final budget process. The FY 2019 request for the ESCE program was \$117 million, but Congress only funded \$50 million.

However, for FY 2020, the request is suddenly a much larger at \$145 million, with projections rising in later years to \$170 million in FY21; \$173 million in FY22; and nearly \$187 million in FY23. This creates a total program cost approaching \$1 billion by fiscal 2024. Real money here may equal real trouble.

In addition to the enhanced diagnostics, ECSE and other related operations will be supported by an additional construction and development program, which the budget calls the "U1a Complex Enhancements Project" (UCEP). UCEP will include "*an increased operational cadence of subcritical weapons experiments using plutonium*" to include 2-3 subcritical experiments per year. For reference, U1a is the name of the underground subcritical test complex. Two to three tests annually represents a major increase in the rate of subcritical nuclear testing.

### **Dangers of Enhanced Subcritical Program— New Nuclear Weapons, Testing**

Tri Valley CAREs and others have raised concerns about subcritical tests along with many aspects of the expensive stockpile stewardship program that have enabled increasingly major modifications to nuclear weapons.

Conducting subcritical tests underground at Nevada Nuclear Security Site (i.e., the Nevada Test Site) poses additional specific risks to the global test moratorium and the CTBT. Subcritical tests are conducted at the same site and exact same shaft and underground facility where fully critical underground nuclear weapons tests were conducted. Subcritical tests play a role in maintaining the readiness of nuclear test site and the ability to prepare for resumption of nuclear explosive tests. We note that some proponents of nuclear weapons are pushing for explosive tests at low-yield, known as "supercritical" tests, which would violate the CTBT and the U.S. observed nuclear testing moratorium.

Preparations for subcritical tests look very similar to preparations for what would be a fully critical test in violation of the CTBT and the test moratorium. Increasing the number of subcritical tests and spending large sums of money on a program called "Enhanced Capabilities for Subcritical Experiments," could easily be viewed as suspect and provocative by other countries.

Expanding and enhancing the subcritical test program in the context of the broader plans of the Trump Administration to develop new nuclear weapons, expand production capabilities, and walk away from arms control agreements, raises alarm bells. Tri- Valley CAREs will continue to counter the rising nuclear dangers, in

part by asking questions, and urging Congress to raise a few of their own, about NNSA's subcritical testing plans. We aim to "turn down the heat" by reducing subcritical tests that, along with other U.S. activities, are firing up a new global arms race.

*(Read more about subcritical test plans in the [Fiscal Year 2020 Department of Energy Budget Request, Volume 1](#) (National Nuclear Security Administration), especially pages 74, 77, 138, 158 and 264.)*

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