



Nevada Site Office News

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ATLAS RESUMES EXPERIMENTAL WORK AT THE NEVADA TEST SITE

Scientists today successfully generated a powerful current — roughly four times all the electrical power on Earth — to create pressures in materials millions of times greater than normal to better understand the conditions in nuclear weapons.

Using the Atlas Pulsed Power Facility at the Nevada Test Site (NTS), scientists from the Los Alamos National Laboratory (LANL), working with the staff of NTS management and operating contractor Bechtel Nevada (BN), performed their first physics experiment to prove that Atlas is ready to support research for the certification of the nation's nuclear weapons stockpile.

In operation, the 650-ton Atlas pulsed-power generator successfully discharged nearly 19 million amperes of electrical current through an aluminum cylindrical shell, or liner, about the size and shape of a tuna can. The current caused the liner to implode at extreme speeds, with unrivaled symmetry, precision and reproducibility.

The goal of the inaugural NTS experiment was to demonstrate that Atlas remains capable of the implosion quality obtained in experiments conducted three years ago in Los Alamos. During the interim period, LANL and BN staff have made significant improvements in the design tools used to create the implosion, the fabrication tools used to build the hardware, and the diagnostic tools used to measure the results, making this one of the best-predicted and best-understood high-precision implosion experiments ever.

The predictability and quality of Atlas implosions enable scientists to characterize the behavior of materials at the extreme conditions in an exploding nuclear weapon. Such detailed data is needed to validate the sophisticated computer codes upon which scientists rely to certify U.S. nuclear weapons in the absence of underground nuclear testing.

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Atlas works as a giant power multiplier, using electrical energy that is accumulated slowly and stored in the machine's capacitors for sudden release into the cylindrical liner. As the electrical current surges through the Atlas machine, it crushes the liner at velocities nearly high enough to escape Earth's gravity — 27,000 miles per hour, or more than 10 times the speed of a high-powered rifle bullet. In the process, Atlas achieves pressures in the liner center that approximate those at the center of the earth, or millions of times that of Earth's atmosphere. During the few millionths of a second that it operates, Atlas generates electrical energy roughly four times the Earth's entire energy production.

Atlas was designed and built in Los Alamos, New Mexico, and recently relocated to the NTS. Planning for Atlas began in 1993 as part of the Department of Energy's (DOE) Stockpile Stewardship program to maintain the nuclear stockpile without underground nuclear testing. The Atlas construction project began in 1995 with engineering design and component tests. Full-scale assembly began in November 1999 and construction was completed in August 2000. After pulse power testing, physics experiments began in September 2001 and continued until September 2002, with a total of 16 physics experiments.

At the direction of Congress, BN began to relocate Atlas to the NTS in October 2002, where it was installed in a new, 14,000-square-foot high-bay building in an industrial research environment in Area 6. Construction work for the relocation project was completed in April 2004, and electrical testing was completed in July 2005.

Design, construction and testing of Atlas in Los Alamos cost \$48 million and the relocation project, including construction of the new building, cost \$20.4 million. Annual operating costs for the machine are about \$6 million. Experimental costs depend on the specific scientific goals, but average about \$1million each.

The Atlas physics and test program is organized and managed by LANL, while BN operates and maintains the machine and facility, both at the direction of the DOE National Nuclear Security Administration (NNSA). LANL is operated by the University of California for the NNSA. BN operates the NTS for the NNSA under the direction of the Nevada Site Office. □

Atlas will support the DOE Stockpile Stewardship Program as part of a tri-lab (LANL, Lawrence Livermore National Laboratory, and Sandia National Laboratories) resource and as a state-of-the-art research facility providing experimental opportunities to investigators from many laboratories, universities and research institutions from the United States and the international scientific community.