Los Alamos
NATIONAL LABORATORY
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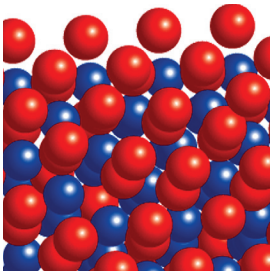
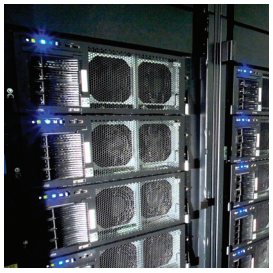
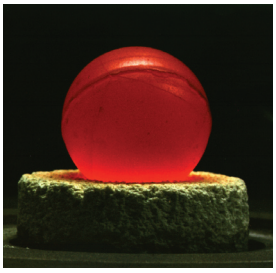




*As a national security science laboratory we provide unique capabilities in support of a credible, sustainable nuclear deterrent*

# **Preferred** Alternative

Los Alamos has been selected as the National Nuclear Security Administration's preferred alternative site for plutonium research, development, and manufacturing, along with nuclear weapons design and engineering, and supercomputing. These areas of emphasis are for Los Alamos part of a national plan to transform the weapons complex - to be more responsive to the emerging threats of the future.

## National security science

The preferred alternative selection confirms that Los Alamos is first and foremost a science R&D Laboratory. The Laboratory is the nation's choice for materials-centric national security science that relies on effective integration of experiments with exceptional theory, modeling, and high-performance computing. Interdisciplinary excellence in theory, modeling, and simulation with experimental science and nuclear science continue to provide the Laboratory with innovative and responsive solutions to broad national security challenges through the agile, rapid application of key science and technology strengths.

## Weapons design & engineering

Los Alamos National Laboratory provides the fundamental science-based understanding of nuclear weapon physics and engineering performance. It is this basic understanding that is the basis for confidence in the nation's nuclear deterrent without the need for further nuclear testing. Los Alamos's design and engineering of both nuclear and non-nuclear weapons components is enabled through small-scale experiments, non-nuclear hydrotests, and subcritical experiments, relying on the full spectrum of scientific excellence across all disciplines, with a focus on materials, high explosives chemistry, and shock physics.

## Plutonium research, development & manufacturing

Los Alamos has a long and successful history in actinide science and limited plutonium manufacturing that support a credible, sustainable nuclear deterrent. The Laboratory's expertise in the production, handling, and processing of nuclear and non-nuclear materials makes it the best, most logical site for future limited plutonium manufacturing.

The Laboratory is the world leader in actinide science — the exploration of the elements from thorium to lawrencium with particular emphasis on uranium and plutonium, a set of elements on the frontier of scientific inquiry. Los Alamos's scientists publish more than 300 studies a year with a focus on the actinide elements.

In 2007, the Laboratory delivered the first war reserve W88 pit in nearly 20 years with small-scale plutonium experiments, legacy test data, groundbreaking materials science, extensive statistical analysis, adapted computer weapons codes, and a refined manufacturing process that results in increased efficiencies and lower costs.

LANL's Seaborg Institute for Actinide Science investigates the science that underpins energy security, nuclear power generation, and the production, purification, characterization, analysis and eventual disposal of actinide elements. The Laboratory also supports actinide research in physics, chemistry, metallurgy, theory, modeling, and experimental technique development.

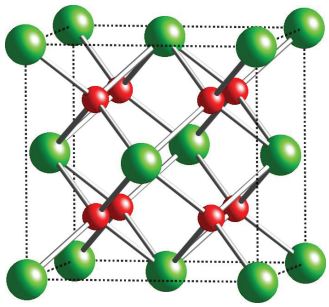
New facilities, such as the Chemistry and Metallurgy Research Replacement building, now under construction, along with materials consolidation, means that the nation's special nuclear materials inventory can be protected to meet the security challenges of the 21st century. Additionally, leading-edge new technologies alongside the latest in best practices and procedures will further enhance the Laboratory's already rigorous approach to worker safety, health, and security.

## Research-driven supercomputing

Computer modeling and simulation, supported by experimental data and utilizing some of the world's most powerful supercomputers, is central to understanding weapons performance in the absence of nuclear testing. The Laboratory has a suite of supercomputing assets, led by "Roadrunner," slated to be the first computer in the world to operate at sustained petaflop speeds. Phase 3 of Roadrunner is a unique hybrid petascale system, a very large cluster of nodes linked together at high speeds. Each computer node in this cluster consists of two AMD Opteron™ dual-core processors plus four Cell™ processors used as computational accelerators. The Cell processors used in Roadrunner are a special IBM-developed variant of the Cell processor used in the Sony PlayStation 3®. The Laboratory's supercomputing assets also enable research of broader scientific questions related to complex systems like Earth's weather, disease pandemics, and the security of the U.S. electricity grid. Los Alamos will continue to be at the forefront of high-performance computing, exploring advanced architectures, operating systems, and applications.

## Broader national security missions

The Laboratory's capabilities in the areas of weapons design, plutonium research, and research supercomputing as outlined above also support a broader set of national security challenges. As the preferred site, the Laboratory would continue its ability to respond quickly to emerging threats, and support a broad spectrum of mission objectives in stockpile stewardship, nuclear energy research, nuclear forensics, nuclear safeguards, and counterterrorism. Large-scale modeling and simulations with broad experimental science capability allow LANL to address challenges such as biothreats, climate change, and infrastructure security. At the same time, world-class nuclear facilities enable waste minimization and environmental cleanup.



*Plutonium Oxide Structure*

Emerging national security challenges also require the Laboratory to advance its scientific user-facility infrastructure and to attract and retain the best talent. Currently in development is a set of facilities called MaRIE, or Material-Radiation Interaction in Extremes. The purpose of MaRIE is to provide tools that would allow the Laboratory to address the critical materials-related scientific questions relevant to a broad spectrum of current and future missions.


*Radiation-monitoring systems in Russia and key borders*

Los Alamos National Laboratory is operated for the Department of Energy's National Nuclear Security Administration by Los Alamos National Security, LLC, a team of Bechtel National, the University of California, The Babcock & Wilcox Company, and Washington Group International

LAUR-07-8356