

National Security: Protecting Our Country, Our People



Since leading America's successful effort to develop nuclear weapons in World War II, the U.S. Department of Energy's National Laboratories have played a central role in keeping our nation secure. That role has expanded and evolved so that the National Labs—in addition to ensuring the safety and reliability of the U.S. nuclear deterrent—are also working to prevent the proliferation of weapons of mass destruction, develop advanced technologies for counter-terrorism, and respond to a host of new threats, from bioterrorism to cyber attacks. With world-class research facilities and a unique capacity to assemble interdisciplinary teams of scientists and engineers, the National Lab System is an indispensable resource in the race to meet this century's complex and rapidly changing security challenges.



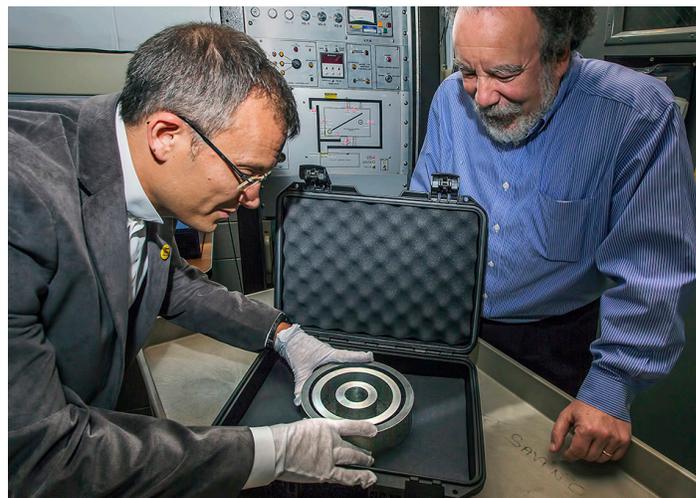
Researchers gain important insights on nuclear explosions using simulations on the National Laboratory System's high-performance computers.

MAINTAINING A SAFE, SECURE, AND EFFECTIVE NUCLEAR DETERRENT

As part of DOE's core national security mission, the National Labs are responsible for ensuring the continued safety, security, and effectiveness of America's nuclear weapons, without reliance on underground testing. Through advances in the fundamental understanding of weapons-related science, coupled with improvements in high-performance computing and simulation, the National Labs' Stockpile Stewardship program has enabled the U.S. to safely extend the service life of its nuclear deterrent while also enhancing our ability to identify and respond to external nuclear threats. Many of the capabilities required to execute this mission are also needed to address other national security responsibilities the Labs have been asked to assume over the years.

ENHANCING GLOBAL NUCLEAR SECURITY AND EMERGENCY RESPONSE THROUGH NUCLEAR MATERIAL CONTROL

Understanding and mitigating the dangers posed by weapons of mass destruction is another key part of DOE's national security mission. To reduce the risk of terrorists or rogue nations acquiring nuclear weapons, the National Labs are



DOE National Laboratory scientists are developing a unique process to verify that nuclear weapons to be dismantled or removed from deployment contain true warheads.

spearheading efforts to locate and secure vulnerable stockpiles of fissile materials worldwide. In some cases, this includes providing physical protection, transferring, and disposing of these materials. The National Labs also developed the tools needed to monitor and detect potentially sensitive fissile or radiological materials. One example is a system for tracking the "down-blending" of highly enriched uranium from nuclear warheads to commercial-grade fuel for nuclear power plants as part of a program that successfully destroyed 500 metric tons of highly enriched uranium. The National Labs have also developed a state-of-the-art neutron detector that can aid in diagnosing nuclear threats and responding to nuclear emergency situations.

COMBATING BIOTERRORISM

Protecting against biological threats is another critical national security priority as dangerous biological agents become more accessible and easier to deploy. Scientific and technological advances are crucial for addressing these threats, and also aid



in the early detection and treatment of naturally occurring infectious diseases. Drawing on deep resources in engineering

Scientists at a National Laboratory combine microbiology, bioinformatics and microfabrication capabilities to characterize unknown biological samples for the potential presence of over 10,000 microbial species in a single measurement using a DNA microarray with 180,000 probes.



and computing, and on expertise gained through the Human Genome Project, the National Labs are at the forefront of America's response to new bio-threats, particularly in the areas of advanced detection and medical countermeasures. This includes developing tools for detecting and analyzing biological attacks and using advanced measurement science and high-performance computing to develop effective medical countermeasures. For example, a powerful synchrotron light source is exploring the molecular structure of botulinum neurotoxin A, one of the deadliest toxins known. This knowledge is being applied to the nanoscale design of specialized inhibitor molecules and enzymes that could be used to combat the toxin.

KEEPING OUR HOMELAND SECURE

The National Labs' contributions to homeland security include tools for explosives detection and cyber security. Specifically, researchers are working to improve understanding of the properties and damage potential of various explosives and to develop improved technologies for explosives detection and response. National Labs are also leading the effort to assess cyber-physical interdependencies, identify cyber vulnerabilities, and develop cyber safeguards for each of the 16 critical infrastructure sectors identified by the U.S. Department of Homeland Security. The Labs support cyber emergency response teams with specialized expertise in protecting sensitive industrial control systems within each of the critical infrastructure sectors. In all of these areas, the National Labs are collaborating with other federal agencies involved in homeland security and, where appropriate, with private industry, while supporting activities that will facilitate the transition of research advances into the marketplace to meet national needs.



DOE's Physical and Cyber Risk Analysis Tool (PACRAT) is a vulnerability and risk analysis software package that blends the methodology and assessment processes used in both the physical and cyber security domains. This blended approach provides an accurate and comprehensive assessment of the overall security strategy, while considering system-level interactions and interdependencies.

For more information about our National Laboratory System:

DOE Website: energy.gov/science-innovation/national-labs

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