LAB AT A GLANCE
LAWRENCE LIVERMORE NATIONAL LABORATORY

Science and technology on a mission – This is the hallmark of Lawrence Livermore National Laboratory (LLNL). In service to the Department of Energy/National Nuclear Security Administration and other federal agencies, LLNL develops and applies world-class science and technology (S&T) to ensure the safety, security, and reliability of the nation's nuclear deterrent. LLNL also applies S&T to confront dangers ranging from nuclear proliferation and terrorism to energy shortages and climate change that threaten national security and global stability.

Using a multidisciplinary approach that encompasses all disciplines of science and engineering, and utilizes unmatched facilities, LLNL pushes the boundaries to provide breakthroughs for counter-terrorism and nonproliferation, defense and intelligence, and energy and environmental security. LLNL was founded in 1952; Lawrence Livermore National Security, LLC has managed the Lab since 2007.

FACTS

- Location: Livermore, California
- Type: Multidisciplinary national security laboratory
- Year Founded: 1952
- Director: William H. Goldstein
- Contractor: Lawrence Livermore National Security, LLC (LLNS)
- Responsible Site Office: Livermore Field Office
- Website: www.llnl.gov

CORE CAPABILITIES

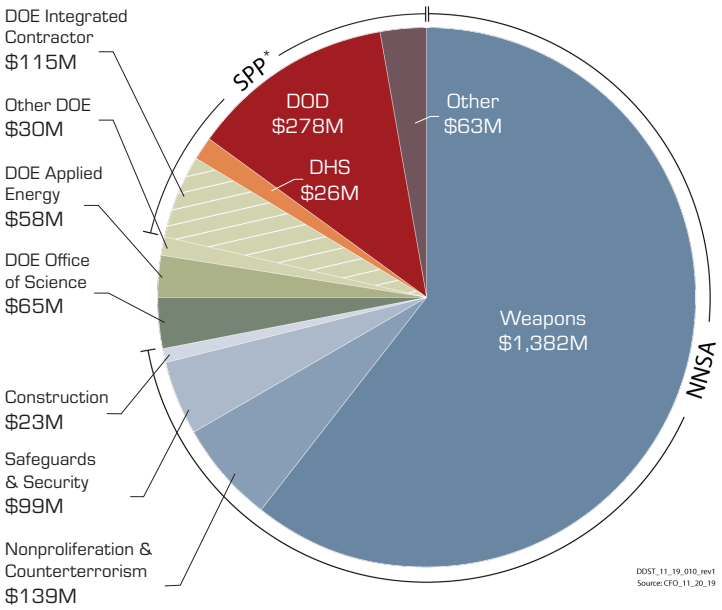
- Advanced Materials and Manufacturing
- High-Energy-Density Science
- High-Performance Computing, Simulation, and Data Science
- Lasers and Optical Science and Technology
- Nuclear, Chemical, and Isotopic Science and Technology
- All-Source Intelligence Analysis
- Nuclear Weapons Design and Engineering
- Bioscience and Bioengineering
- Earth and Atmospheric Sciences

MISSION-UNIQUE FACILITIES

- National Ignition Facility
- Livermore Computing Complex
- National Atmospheric Release Advisory Center
- High-Explosives Applications Facility
- Contained Firing Facility
- Forensic Science Center
- Center for Micro and Nanotechnology
- Center for Bioengineering
- Center for Accelerator Mass Spectrometry
- Advanced Manufacturing Laboratory

FY2019 FUNDING BY SOURCE

(Total: $2,277,893,407)



FY2019 COSTS

- FY19 LLNL operating costs: $2.21 billion
- FY19 DOE/NNSA costs (incl. DOE IC): $1.9 billion
- FY19 SPP costs (excl. DHS & DOE IC): $306 million
- FY19 SPP (excl. DHS & DOE IC) as total operating costs: 13.9%
- FY19 DHS costs: $23 million

PHYSICAL ASSETS

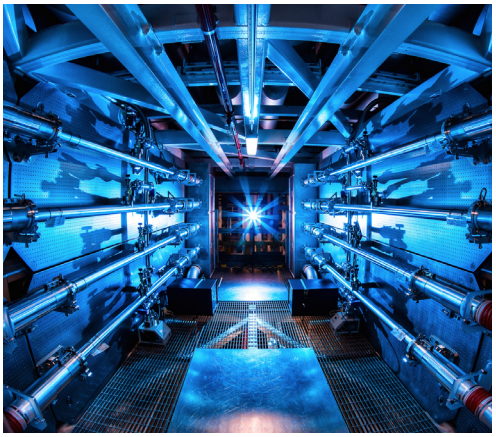
- 7,700 acres (owned) and 517 buildings/trailers
- 6.4 million gross square footage (GSF) in active buildings
- 0.6 million GSF in 88 non-operational buildings
- 24,000 GSF leased
- Replacement plant value: $20.2 billion**

HUMAN CAPITAL

- 7,378 LLNS employees, including:
  - 18 joint faculty
  - 253 postdoctoral researchers
  - 184 undergraduate interns
  - 138 graduate students
- 531 contractors (non-LLNS employees)

*SPP: Strategic Partnership Projects **In FY2019 NNSA implemented a new tool (BUILDER) to calculate the replacement plant value (RPV) for buildings and trailers. The change in modeling platforms produced new values and we are in the process of validating the updated figures with NNSA. In FY20+, the utility and OSF assets will start migrating into BUILDER.

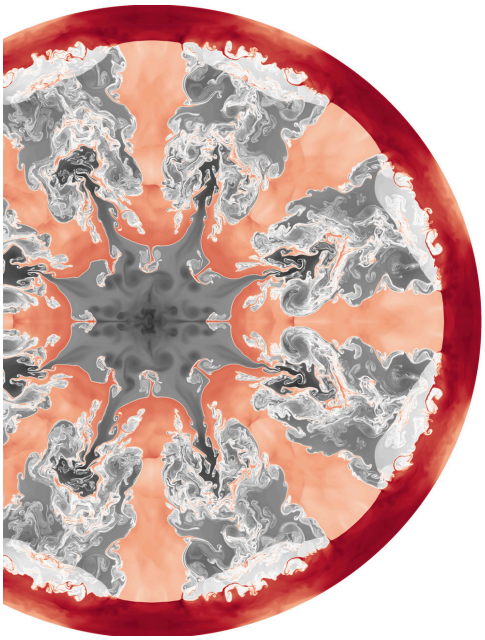
LABORATORY HIGHLIGHTS



UNIQUE FACILITIES

The world's largest, most energetic laser

Lawrence Livermore is home to the National Ignition Facility (NIF), the world's largest and most energetic laser. NIF's 192 beams create the extreme temperatures and pressures necessary for advancing science-based stockpile stewardship, pursuing the prospect of laser fusion ignition, and deepening our understanding of the universe. In NIF experiments thousands of optics focus laser light onto a 10-meter-diameter target chamber and onto miniature highly engineered targets. NIF is the nation's premiere facility for creating conditions relevant to understanding the operation of modern nuclear weapons and to validate 3D simulations of weapon physics. NIF is designed to perform experimental studies in the pursuit of fusion ignition and thermonuclear burn, a scientific grand challenge. A recent experimental campaign achieved a fusion yield of 19 quadrillion neutrons and 54 kilojoules of energy output, 75 percent of the conditions for achieving fusion ignition.



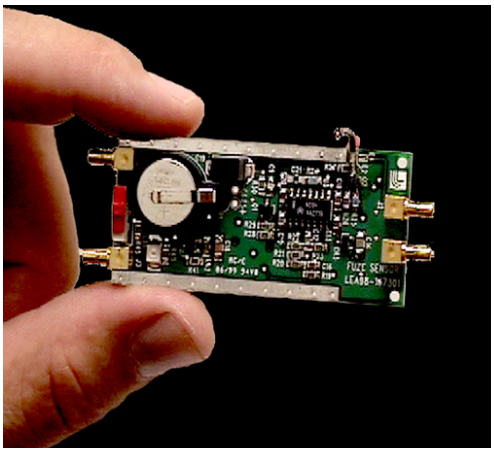
CUTTING-EDGE RESEARCH

Extreme-scale simulations

Since the start of the Stockpile Stewardship Program in the 1990s, LLNL has worked hand-in-hand with U.S. industry to improve high-performance computing (HPC) power for scientific simulations more than a million-fold. High resolution, 3D simulations with more accurate representations of the physics involved in nuclear weapon performance are critical to ensuring the safety, security, and effectiveness of the enduring stockpile. LLNL scientists also use HPC to study everything from the nanoscale mechanics of pathogens docking at protein receptors to natural and human influences on the Earth's climate.

In October 2018, LLNL dedicated Sierra, ranked the third-fastest supercomputer in the world. Sierra serves the National Nuclear Security Administration (NNSA) by providing extremely high-fidelity simulations in support of stockpile stewardship. The machine will enable scientists to answer scientific questions previously beyond their reach. It is NNSA's first large-scale production heterogeneous system, meaning each of its 4,320 computing nodes incorporates both central processing units and graphics processing units.

Sierra continues the long lineage of world-class LLNL supercomputers and represents the penultimate step on the road to exascale computing, which is expected to be achieved by 2023 with an LLNL system called El Capitan.



TECHNOLOGY TO MARKET

Micropower impulse radar

The Laboratory's micropower impulse radar (MIR) is a compact, lightweight, inexpensive radar that uses very short electromagnetic pulses and can detect objects at much shorter range than conventional radar. MIR has found use in a range of applications, including fluid level sensing, medical applications, nondestructive evaluation, motion detection, and devices to detect breathing through walls or rubble—to assist in rescue after disasters.

The technology was the first truly portable radar system that SWAT and land-mine detection teams were able to use in the field. Search and rescue missions, including those on 9/11, have used MIR devices to detect lung or heart movements of people buried under rubble. Since 1994, MIR has held 197 patents and 44 licenses—more than any other technology in LLNL history and has achieved lifetime sales in the tens of millions. It was developed using $10 off-the-shelf materials.

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