# Fueling California's Economy

Through business and community partnerships, LLNL's science, technology, and engineering strengthens the state's economy by providing jobs and economic opportunities.

## LLNL's Economic Impact

Lawrence Livermore National Laboratory (LLNL), located in Livermore, California, is a research and development facility for science and technology solutions to some of our nation's greatest challenges. Managed by Lawrence Livermore National Security, LLC, (LLNS), LLNL has an annual budget of nearly $2.5 billion, and has roughly 7,900 LLNS employees. It is largely funded by the Department of Energy's National Nuclear Security Administration.

LLNL's economic impact in California manifests itself directly through its payroll to its employees, and through procurements awarded to companies operating within the state. The Laboratory stimulates commercial activity through the transfer of its technologies to licensees ranging from startups to fortune-500 companies. LLNL also develops research-based public-private partnerships to improve business access to world-class scientific capabilities to help them improve their technologies.

In Fiscal Year 2020, LLNL awarded more than $769 million in procurements to businesses, both in California and across the nation, for a broad range of products and services that support the Laboratory's overall mission. Over $1 billion worth of products with LLNL technology inside were sold worldwide in the past 5 years.

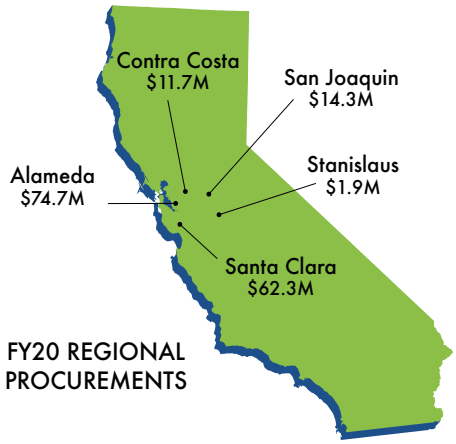
## California Success Stories

**Dyna-3D:** Developed at LLNL by John Hallquist, this software analyzes and visually portrays the effects of stresses on computer-generated 3-dimensional objects. Hallquist launched Livermore Software Technology Corporation (LSTC) in Livermore, CA and matured the original software into LS-DYNA. The automobile industry, among others, uses LS-DYNA to simulate crashes and conduct safety testing. LSTC was sold to ANSYS Inc. in 2019 for $775 million.

**Micro Impulse Radar (MIR):** Pioneered at LLNL, MIR single-handedly revolutionized radar technology. A compact, low power, low cost, short range radar system, it is used around the world in a wide range of applications. For example, MIR operates automatic doors or gates, is a motion detector for alarm systems, automobile blind-spot detection, and anti-crash systems. MIR can also be used to non-destructively analyze vehicle roadways and bridges.

**DNA-TRAX:** Foodborne diseases cost the U.S. an estimated $150 billion annually. SafeTraces, Inc. licensed an LLNL-developed spray-on DNA-based barcode technology that can track the source of contaminated food in the supply chain in just minutes rather than days or weeks. SafeTraces aims to reduce food safety concerns such as contaminated and counterfeit food.

## LLNL FY20 Fueling California's Economy

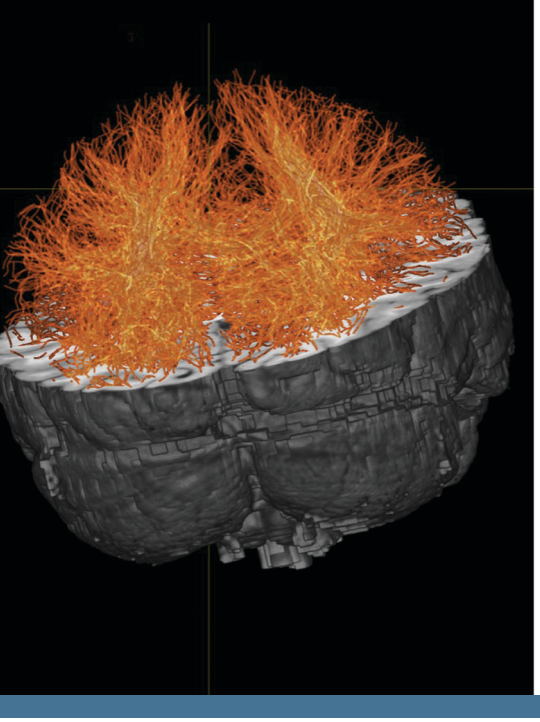


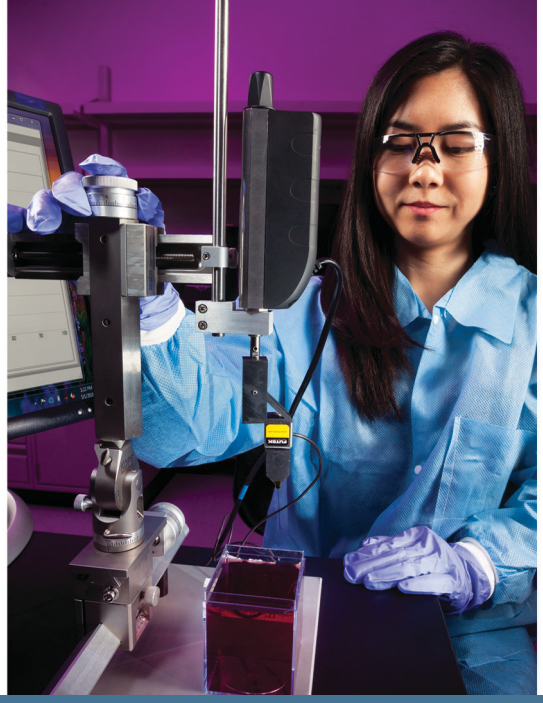

FY20 REGIONAL PROCUREMENTS

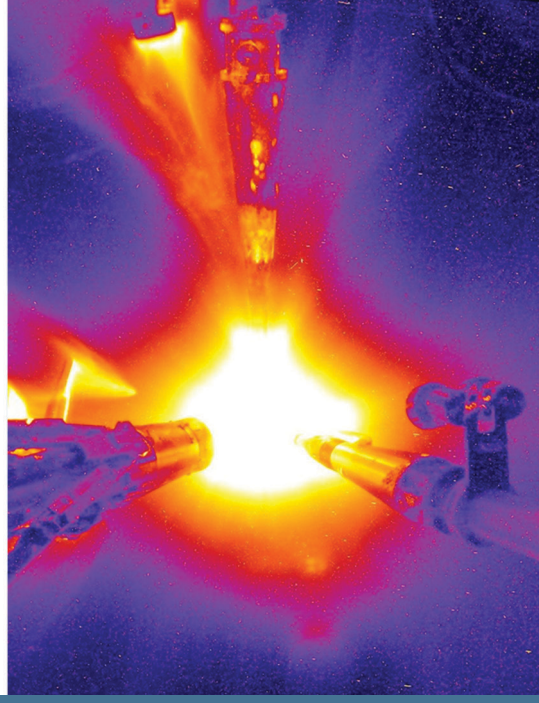
**$240 M**
CA PROCUREMENTS AWARDS

**$769 M**
TOTAL PROCUREMENTS AWARDS

- 79 companies with active commercial licenses, 38 based in California
- $1.03 billion total California payroll







## LLNL as a Business Partner

The Laboratory focuses on innovation initiatives that will develop public/private partnerships and grow high-technology business opportunities in the Tri-Valley and greater San Francisco Bay region. Furthering these goals are LLNL's relationships with regional organizations such as the California Clean Energy Fund, the Bay Area Council, East Bay Economic Development Alliance, Silicon Valley Leadership Group, and the Innovation Tri-Valley Leadership Group.

LLNL's Innovation and Partnerships Office (IPO) spearheads the Laboratory's engagement with industry. Whether through technology commercialization, encouraging entrepreneurship, or business development activities, the primary mission is to grow the economy by advancing the development and commercialization of scientific discoveries.

IPO has active commercial licenses with 91 companies as well as dozens of cooperative research and development agreements (CRADAs). Licensing and royalty income in 2020 topped $4.6 million, while over the previous five years there were more than $1.3 billion in sales of products based on LLNL technology. LLNL-licensed technologies have enabled the launch of numerous new businesses that are helping to drive economic growth locally, regionally, and beyond. Additionally, the Laboratory participates in events and organizations that support technology innovation and business development. Here are some examples:

- **University Partnerships:** LLNL and Stanford University collaborate to create multi-scale models and prototype devices for the electromechanical production of chemicals from $CO_2$. The project aims to improve carbon capture, storage, and utilization technologies, which will reduce $CO_2$ and reliance on fossil fuels and chemicals.
- **Industry/Non-Governmental Organizations:** The High Performance Computing for Energy Innovation program (HPC4EI) offers U.S. industry access to LLNL's superior computing power to improve their global competitiveness. One example: LLNL works with Santa Clara materials engineering firm Applied Materials to improve a process for depositing thin-film materials on wafers used in LED lights.
- **Community Partnerships:** LLNL supports the i-Gate innovation hub, located in the city of Livermore, California, for regional entrepreneurs.
- **State Government Partnerships:** The California Energy Commission funded an LLNL effort to reduce the cost of water desalination and increase water reuse to help California through future droughts.

## Expanding Partnerships

The Advanced Manufacturing Lab (AML) is a new collaborative hub for developing next-generation materials and manufacturing technologies. The 13,000-square-foot facility is located in LLNL's growing Livermore Valley Open Campus, and features two laboratories (a reconfigurable "wet" chemistry lab and a "dry" instrument lab), a collaboration space, conference area and support rooms with a potential for future expansion.

Expanding on LLNL's existing infrastructure and expertise in materials science, engineering, and additive manufacturing, the AML combines high-performance computing, modeling, and simulation to rapidly advance research into emerging manufacturing technologies.

The AML enables two-way learning and transfer of technology and capabilities between industry and LLNL.

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