Sandia National Laboratories

Presentation to

California Council on Science and Technology

by

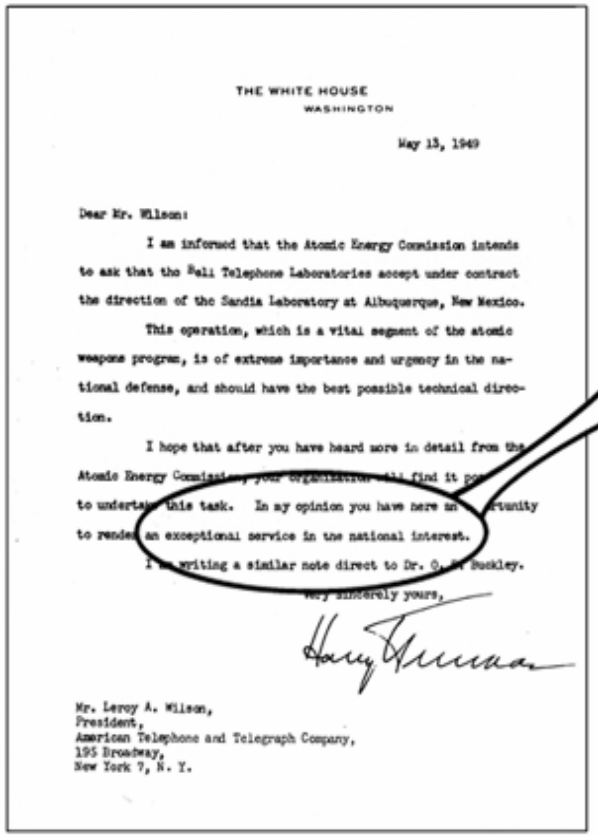
Mim John
Vice President, CA Division and Homeland Security SMU
Sandia National Laboratories

February 3, 2005

Sandia National Laboratories

Sandia was established in 1949 to serve the national defense needs of the nation

"Exceptional Service in the National Interest"



THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the direction of the Sandia Laboratory at Albuquerque, New Mexico.

This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction.

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. O. E. Buckley.

Very sincerely yours,

Harry Truman

Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

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Sandia National Laboratories

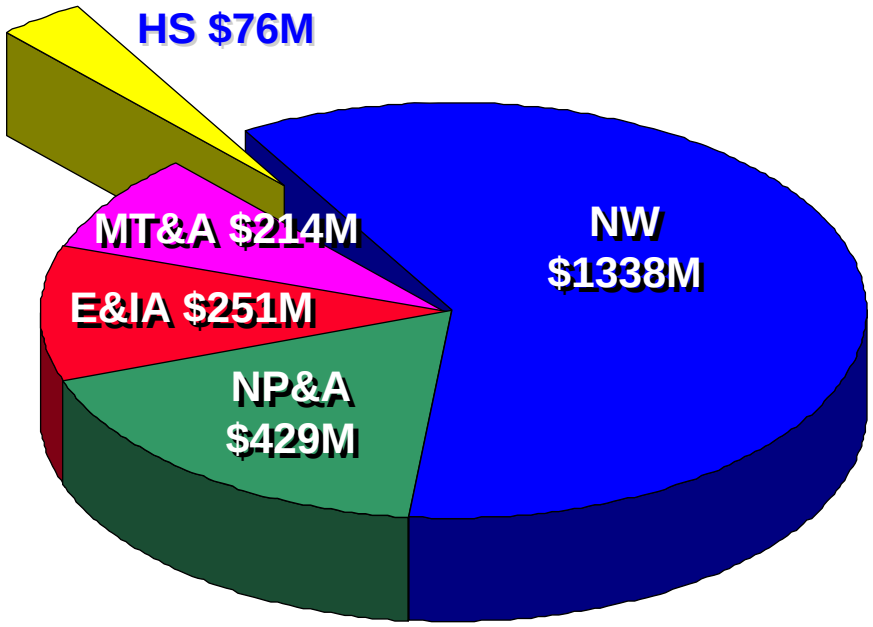
Sandia's heritage and management philosophy

- First managing contractor was AT&T: Bell Laboratories model
- Martin Marietta (now Lockheed Martin) took over in 1993
- Industrial model of research and development:
  - An applied science/engineering laboratory
  - Research that supports the mission
  - A culture of teamwork that cuts across organizational boundaries
  - Vertical integration of the product development cycle from research to manufacturing
- Pervasive mission role in technical systems integration

Sandia National Laboratories

Sandia's programs focus on national security

FY04 Revenue ($2.3B)

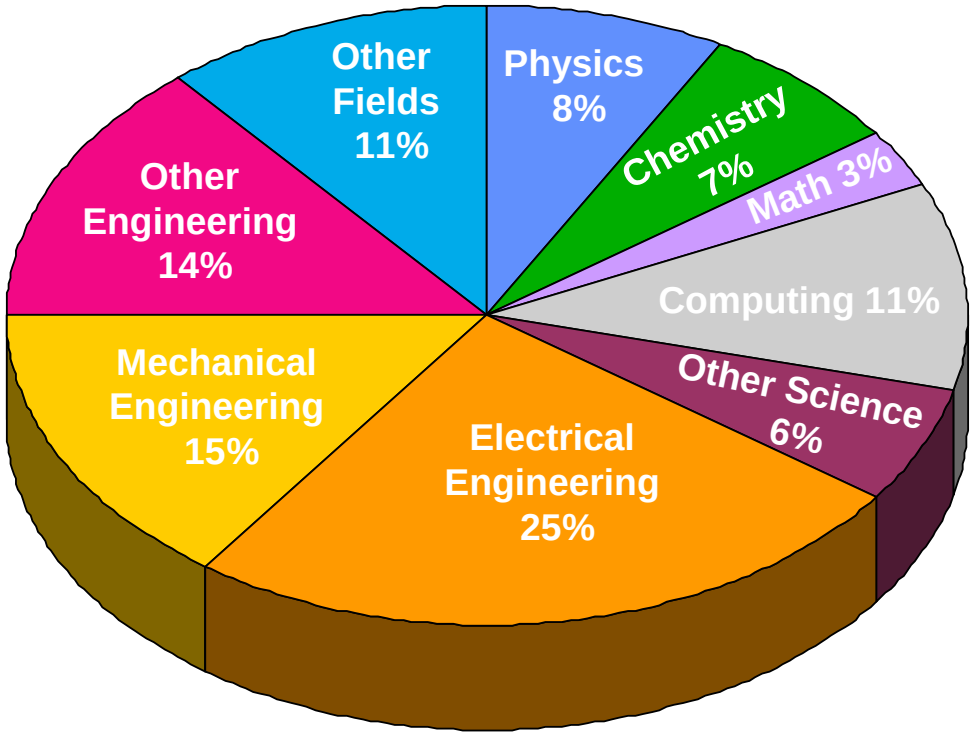


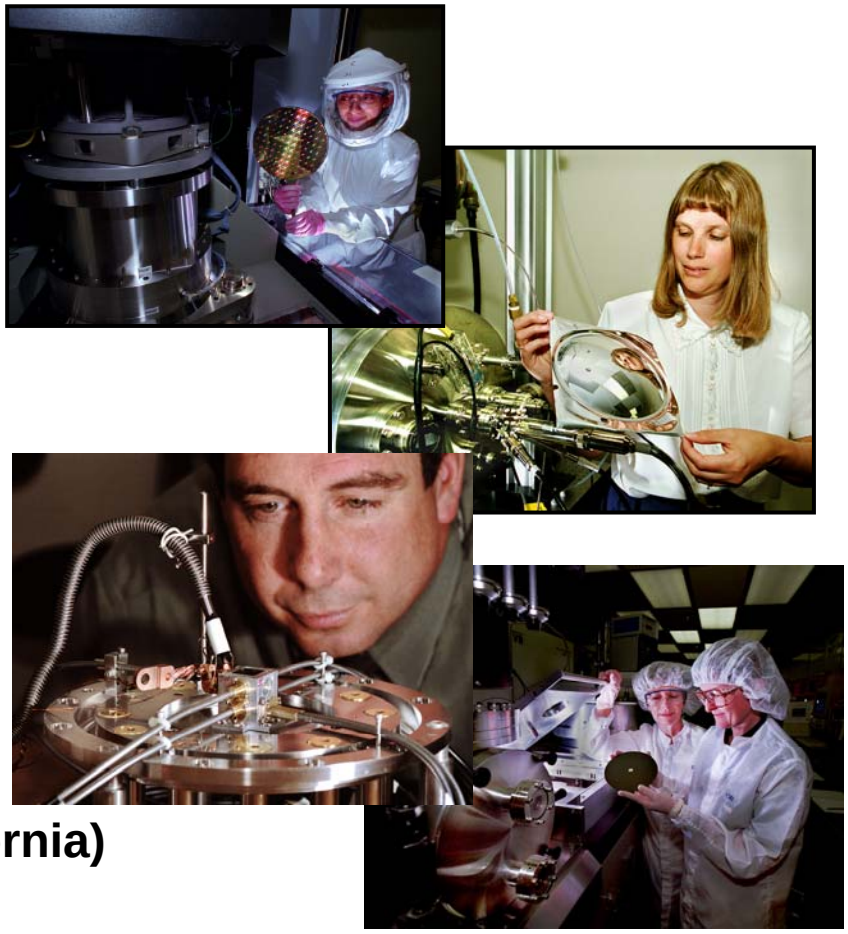
- Homeland Security
  - Chem, Bio & Rad
  - System Analysis
  - Cyber and Info Security

- Nuclear Weapons
  - Directed Stockpile Work
  - Research Foundations
  - Laboratory Stewardship
- Nonproliferation & Assessments
  - Proliferation Assessment
  - Remote Sensing & Verification
  - Intelligence/Counterintelligence
- Energy & Infrastructure Assurance
  - Office of Science
  - Environmental Management
  - Energy Assurance
- Military Technologies & Applications
  - New Triad
  - Homeland Defense
  - Emerging Technologies & Applications

Sandia National Laboratories

Sandia employs approximately 8,500 highly skilled workers (plus 2100 on-site contractors)





~8,500 full-time employees (~ 900 in California)
1,500 PhDs and 2,300 Masters

Sandia National Laboratories

Sandia National Laboratories is distributed

Albuquerque, New Mexico

Kauai Test Facility
Hawaii

Tonopah Test Range,
Nevada

Yucca Mountain,
Nevada

WIPP,
New Mexico

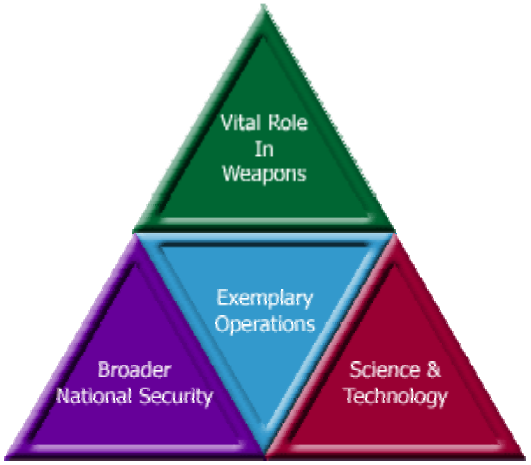
Pantex,
Texas

Livermore,California

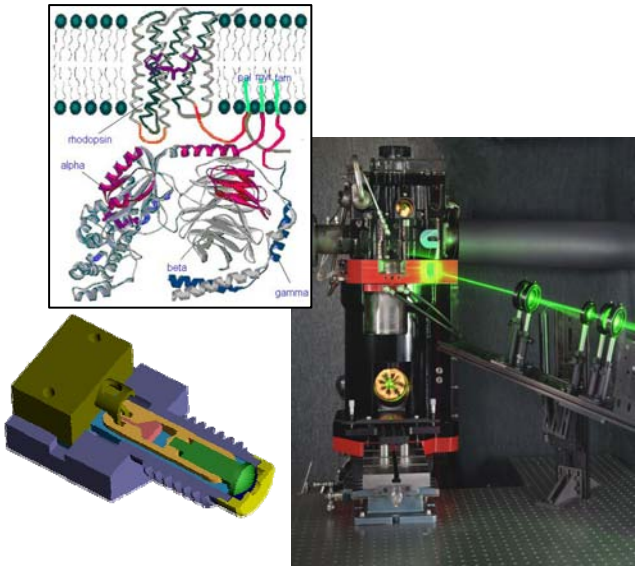
Sandia National Laboratories

Sandia/California is helping the Laboratory achieve its highest goal: “The lab the nation turns to first…”

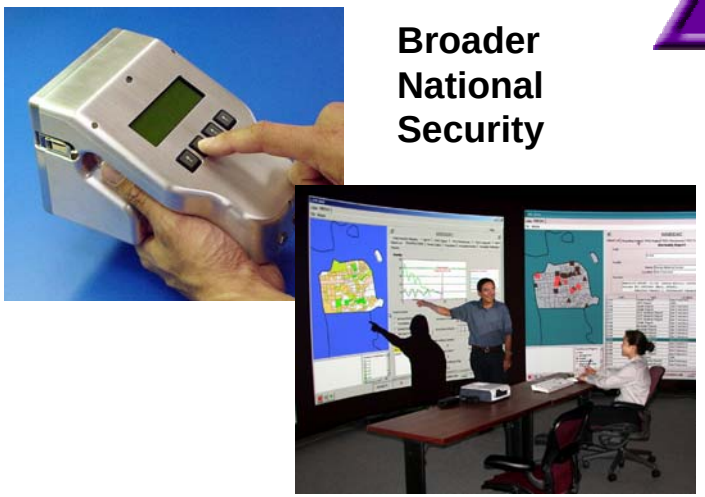
Vital Role in Weapons



SNL/CA Business Model



Science & Technology



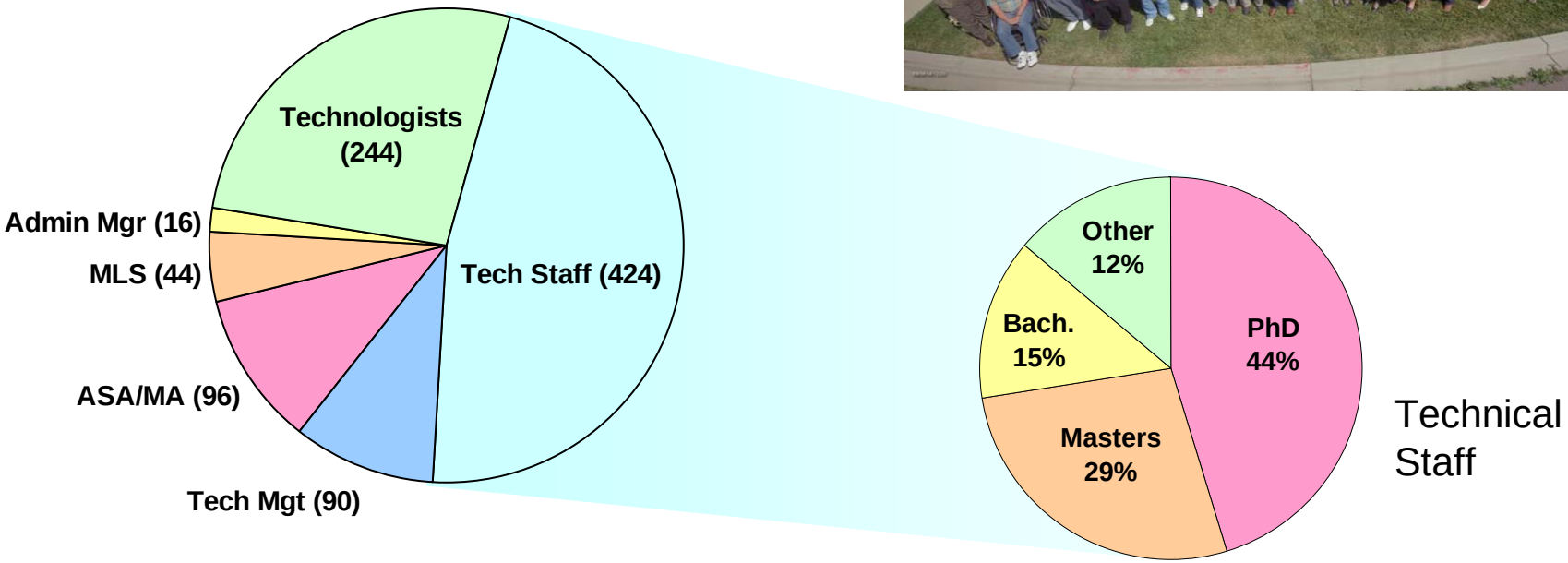
Broader National Security

Exemplary Operations

Sandia National Laboratories

Sandia/California facts

- **$276M managed funds**
- **912 regular employees**
- **205 LTE, post docs, contractors**



All data as of 12/04

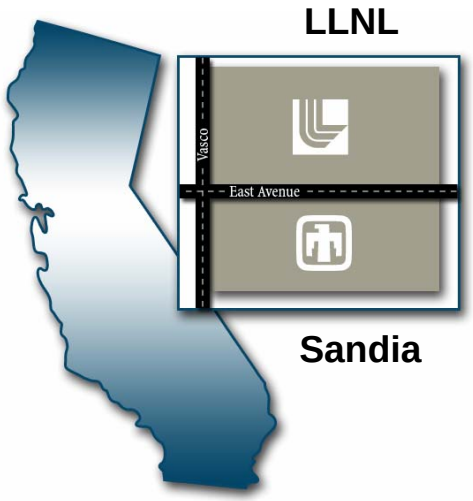
Sandia National Laboratories

Differentiating Sandia/California characteristics

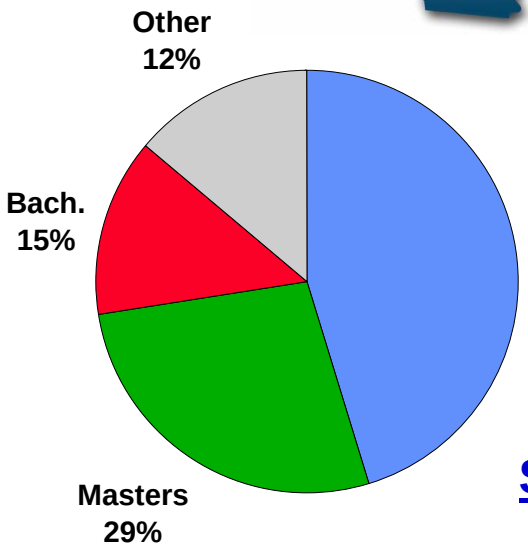
Capabilities

- Gas-phase chemical diagnostics
  - Remote sensing
- LIGA microsystems
- Microfluidics
- Combustion sciences
- Protein sciences
  - BSL-2 Labs
- Secure distributed information systems
- Hydrogen science and technology

Location



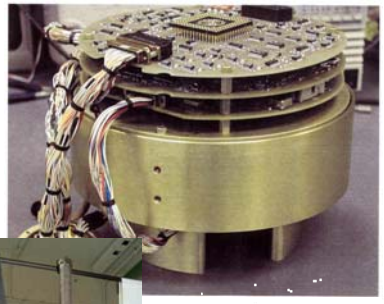
Staff Mix

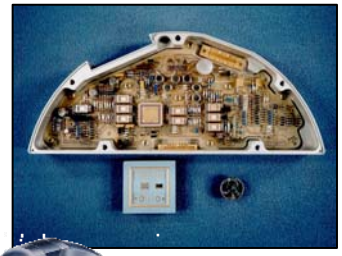


Sandia National Laboratories

The site has unique roles in the NW program derived from our ties to LLNL and our S&T base

Historical role…





Use Control Systems

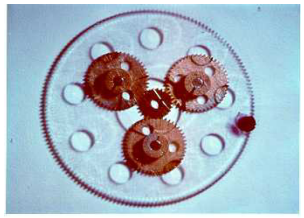
Gas Transfer Systems

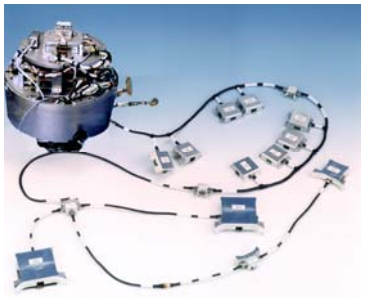
JTA Telemetry

W62 Warhead for Minuteman III
W80 Warhead for TLAM-N, ALCM, and ACM
B83 Modern Strategic Bomb
W84 Warhead in the Inactive Reserve
W87 Warhead for Peacekeeper & Minuteman III

…Micro and info technology infusion

LIGA process technology





Distributed Information Technologies & Systems

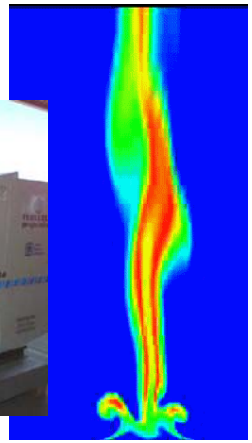
Distributed TM Systems

Sandia National Laboratories

Our missions include broader national security roles which complement our nuclear weapons work

Homeland Security

Military Technologies



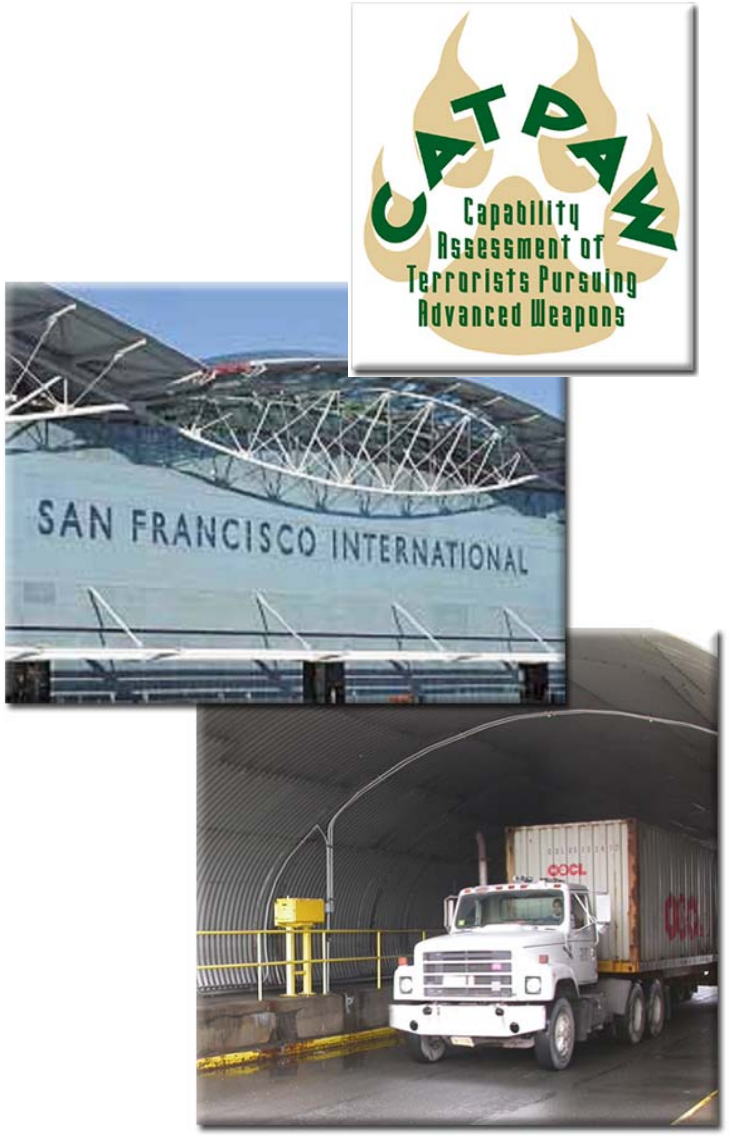
Energy Assurance

The site's DHS emphases are in chem/bio, rad/nuc, systems analysis, and simulation.

Sandia National Laboratories

Our contributions are helping to build DHS's S&T core competencies

- Awareness of current and future threats
  - e.g. CATPAW database of terrorist-related information
- Systems for prevention, protection, response and recovery
  - e.g. PROTECT/PROACT
- Field operations and consequence management
  - e.g. Transportation Testbed, Operation Safe Commerce
- Scientific leadership . . .
  - Through DOE and SNL internal investments



Sandia National Laboratories

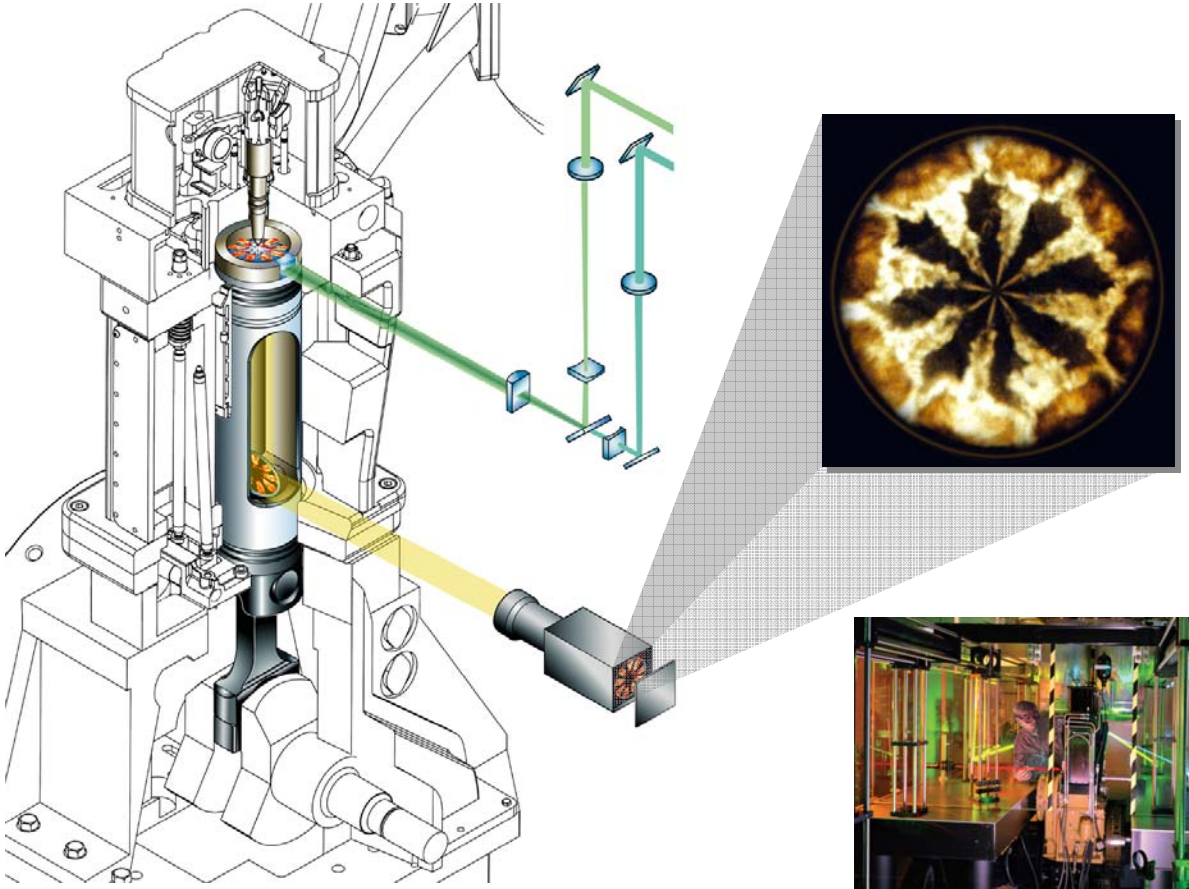
Partnering is key to success of DHS national lab programs

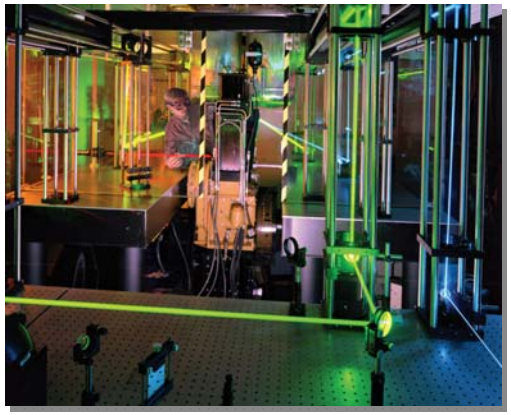
- **Labs; e.g.,**
  - Biodefense Knowledge Center (LLNL)
  - NISAC (LANL)
  - Biobriefcase (LLNL)
- **Industry; e.g.,**
  - Explosives detection (Personnel Portal Monitoring System with Smith Detection)
  - Decontamination foam (with EnviroFoam and Modec)
  - Next generation bio agent detection (with Waters Inc.)
  - Bio Instrumentation

    First DHS CRADA (Molecular Probes Inc.)
  - Nuclear detection (with Thermo Electron)

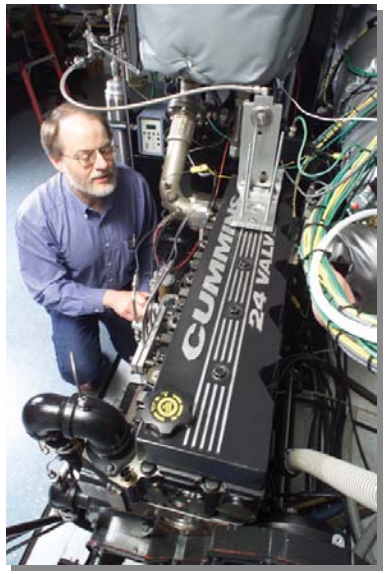
Sandia National Laboratories

We have a 25 year history in the Combustion Research Facility on developing advanced engines and fuels





Advanced diagnostics probe combustion in practical devices.



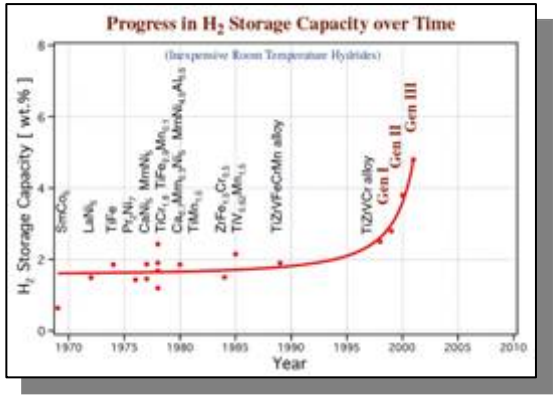
Sandia National Laboratories

Our hydrogen expertise has positioned us as a national hydrogen program Center of Excellence

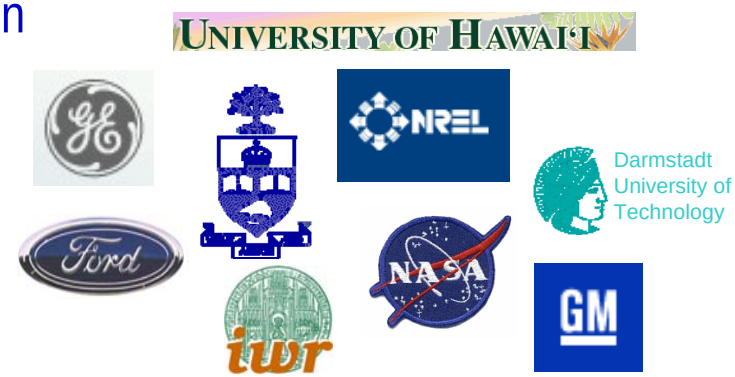
Solid-state hydrogen storage for fuel cell vehicles

Codes and Standards

Last month, GM and Sandia, announced a 4-year, $10 million program to design and test an advanced method for storing hydrogen based on metal hydrides.



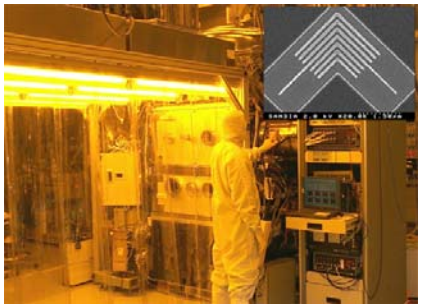
Metal Hydride Research



Collaborations

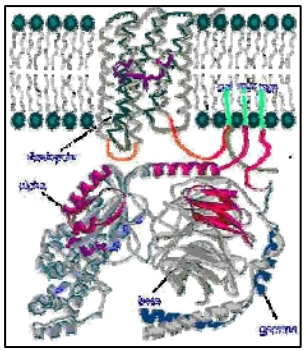
Sandia National Laboratories

Science and technology is a site mission itself–and essential to our applied missions



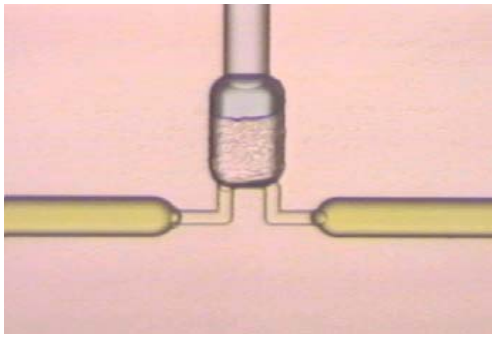
Extreme UV Lithography: First prototype produced at Sandia: 2003 R&D 100 award

Complex cellular functions: Studying membrane signaling proteins

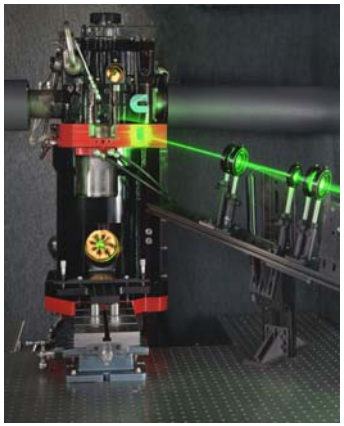


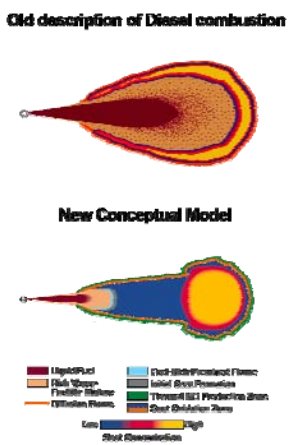
Putative rhodopsin-transducin complex in human vision system

Microfluidic electrokinetic pumps: 2003 R&D 100 award

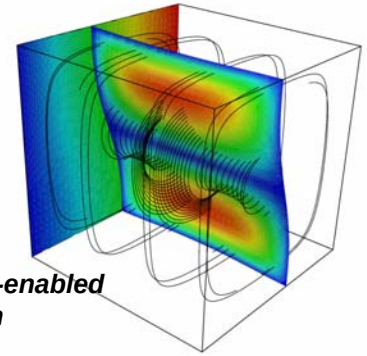


Basic science for combustion: Improving diesel efficiency and reducing emissions. 2005 DOE INCITE award for simulation.





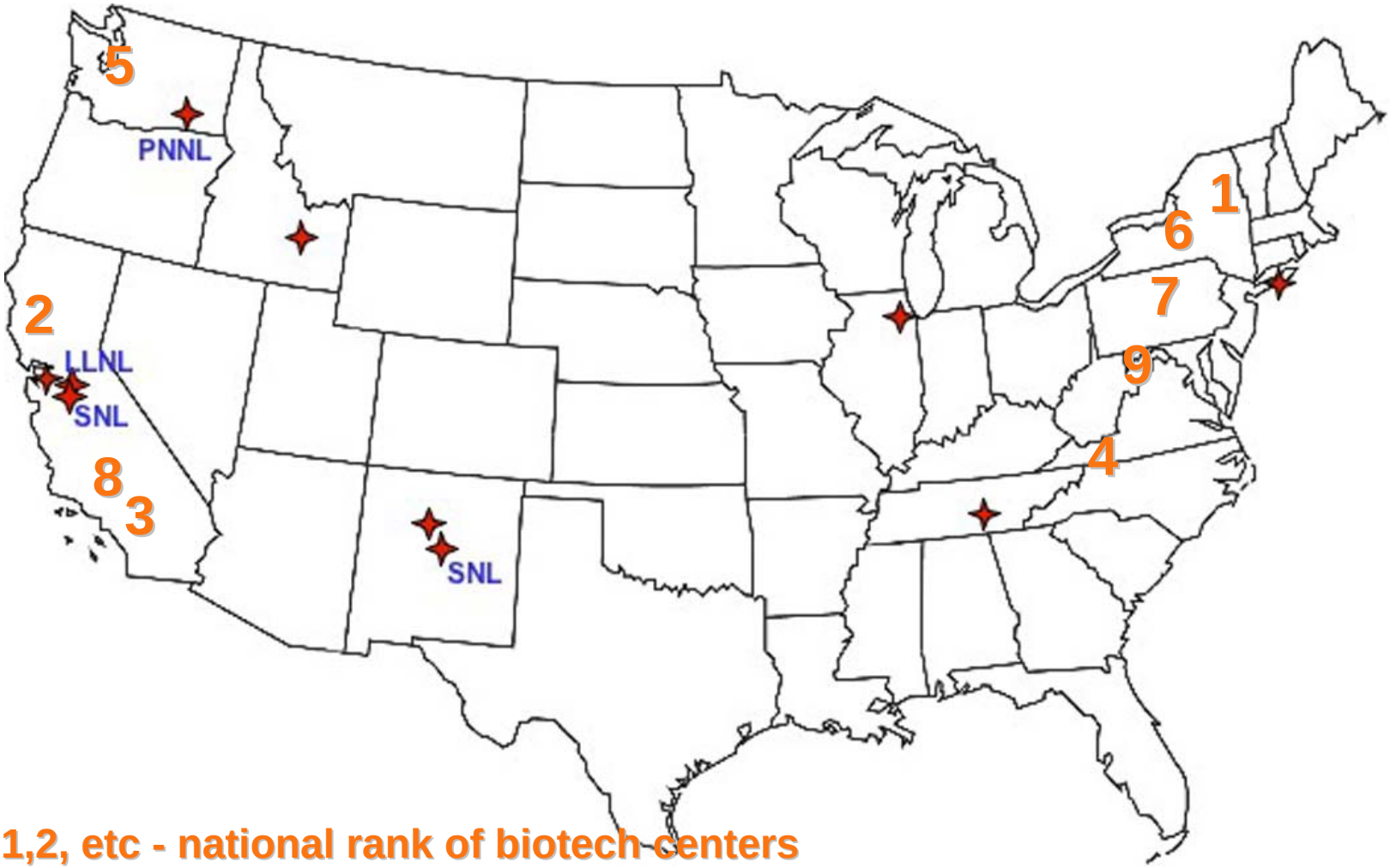
Advanced Simulation and Computing-mathematical solvers: 2004 R&D 100 award



TRILINOS-enabled simulation

Sandia National Laboratories

SNL, LLNL, and PNNL are combining strengths to propose building a bioscience facility (the Protein Production Factory) in California

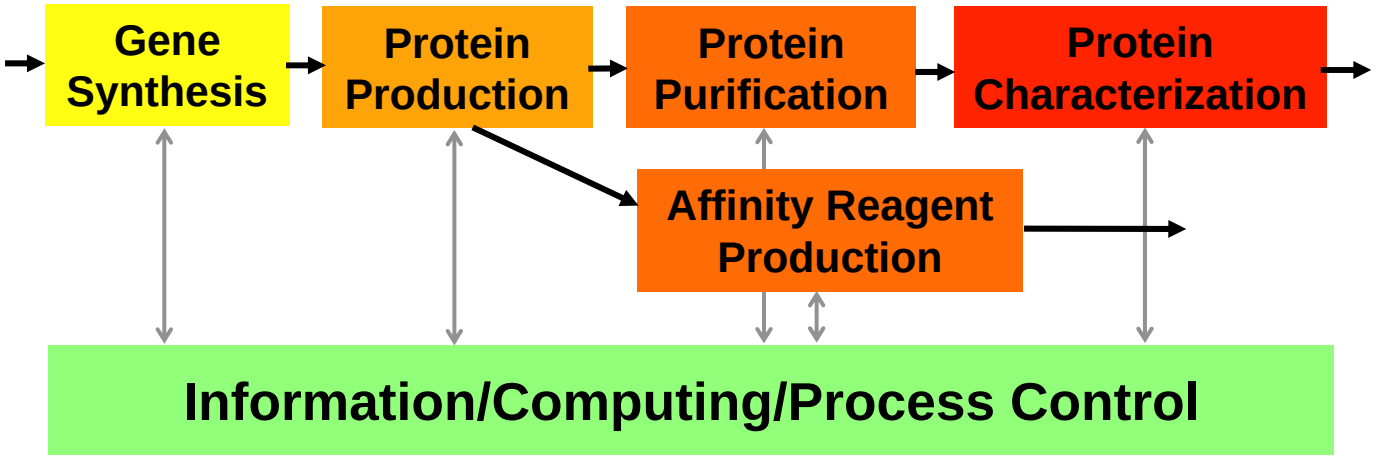


1,2, etc - national rank of biotech centers

National Laboratories

Sandia National Laboratories

Industrial and academic partners are critical to meeting cost and performance goals of the PPF



10,000 proteins per year with multiple reagents @ $4K/protein

Industrial Partners

- Invitrogen (committed)
- Protometrix (committed)
- Kinematik (committed)
- Blue Heron Biotechnology
- Cell Free Science
- deCODE Genetics
- Dyax
- Kalypsys

University Partners*

- University of California (multiple campuses)
- University of Washington
- Stanford University
- Scripps Research Institute

Sandia National Laboratories

Across the board, partnerships are a key to success

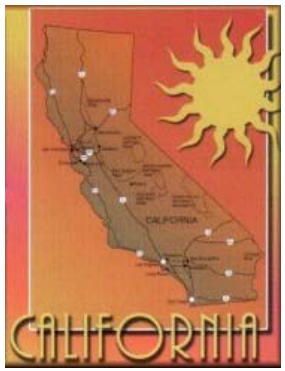
Lab Partnerships on Homeland Security:

- Strong teaming with LLNL
- WMD counter-terrorism
  - nuclear, chem, bio
- Cyber-security
- Systems analysis

CA Universities

- UCD & UCB Campus Exec. Fellowships
- UC Davis Research Advisory Board
- Technical collaborations: Stanford, UCB, UCSF, UC-Davis

Growing CA Engagement



- BASIC
- CCST
- JPL Technical Division Advisory Board
- CA Hydrogen Highway Network

Industrial Partnerships

- CH2M Hill & Tenix (water protection)
- Cummins (engines)
- GM (hydrogen)
- Waters (µfluidics)

Sandia National Laboratories

Path forward – Achieving CA's strategic goals through improved state-laboratory interaction

- **Enhancing California's position as a world leader in S&T**
  - **Focus on nanoscience, bioscience, and energy science and technology**
  - **CCST as facilitator of CA research coalitions (universities and labs) and as advocate for targeted federal investments**
- **Exploiting laboratory innovations for strategic state industries**
  - **Focus on microelectronics, information technology, and biotechnology**
  - **CCST as marketing agent for S&T community and facilitator with industry**
- **Enabling CA leadership in the next-generation energy economy**
  - **Focus on hydrogen, clean power generation, and transportation efficiency**
  - **CCST/State establish CA pilot**
- **Realizing the goal of a safe and secure homeland**
  - **Reduce WMD threats to critical economic & population centers**
  - **CCST as advocate for targeted state/federal investments in regional testbeds and state/laboratory partnership projects**

Sandia National Laboratories