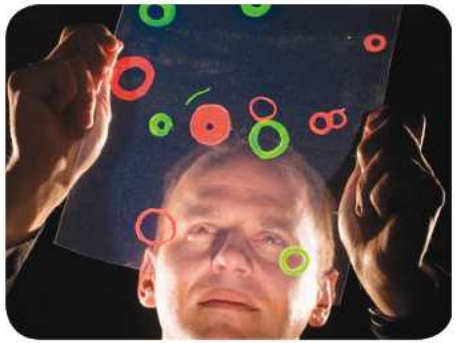
SAND2014-2698P

Exceptional service in the national interest

Sandia National Laboratories


Sandia National Laboratories

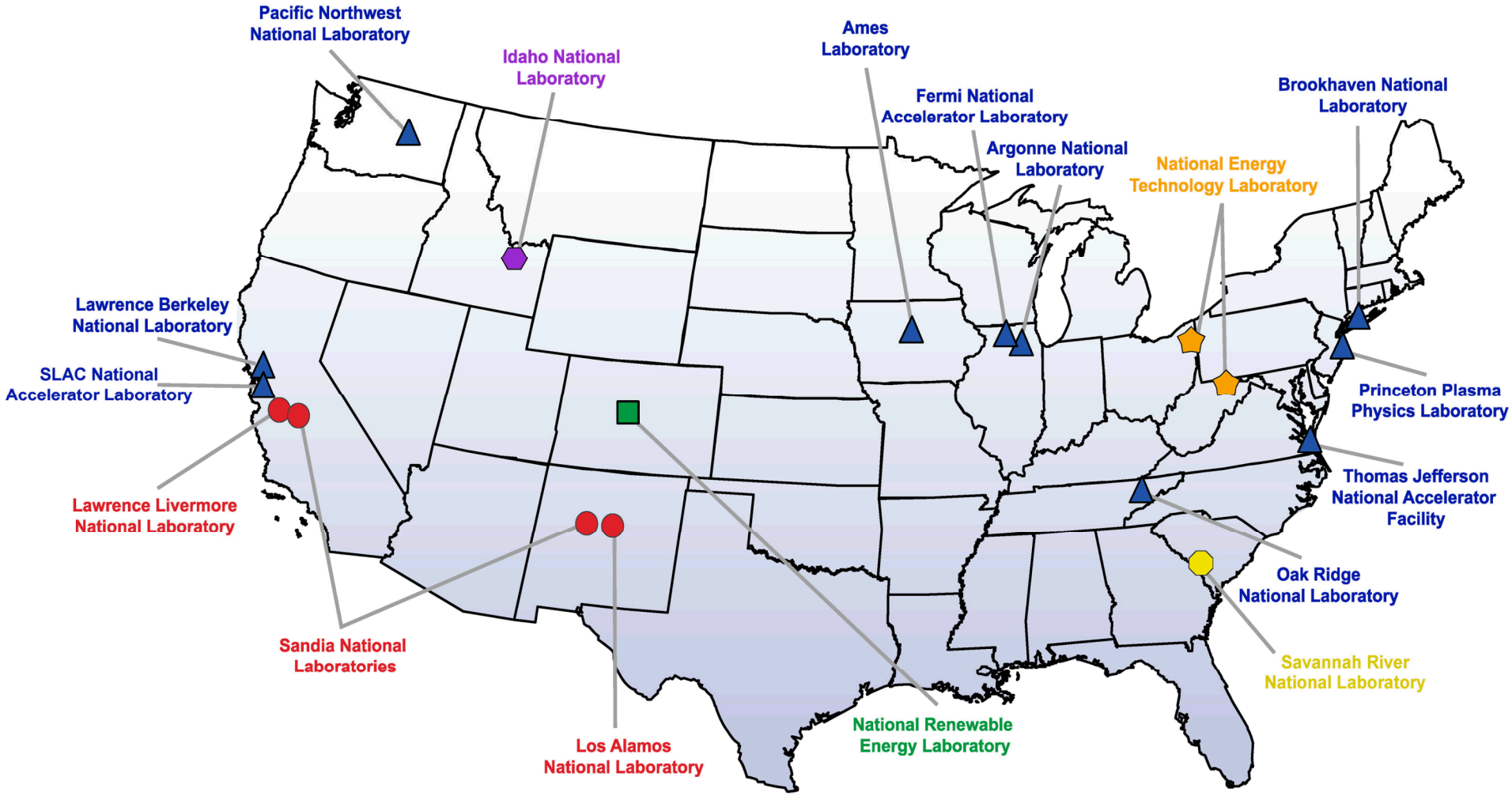
Bianca Thayer
License Executive/Tech Transfer

BASF Workshop April 8, 2014

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2013-1967 C

Sandia is part of a network of Department of Energy national laboratories

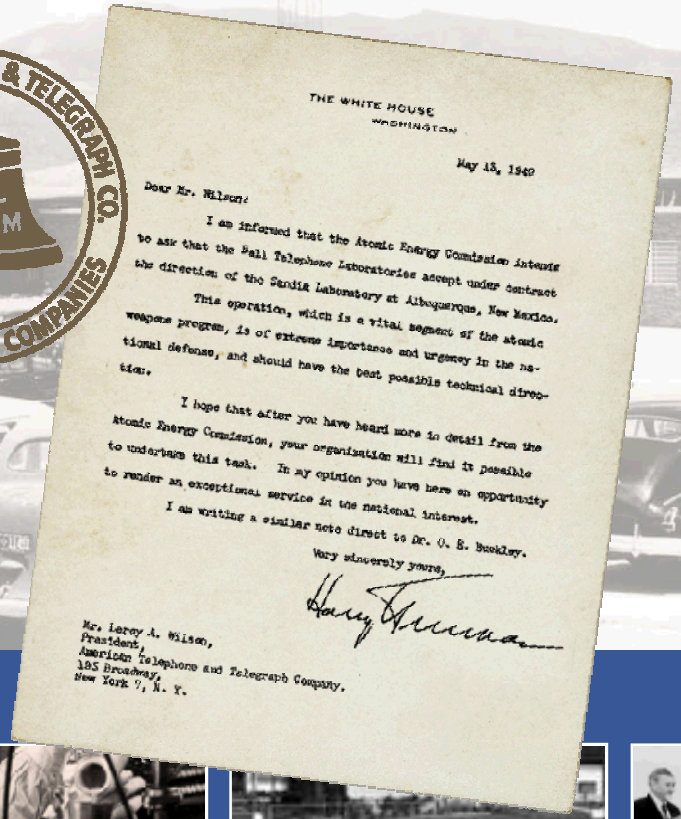
Sandia National Laboratories



Sandia's history

Exceptional service in the national interest

Sandia National Laboratories



THE WHITE HOUSE
WASHINGTON

May 18, 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.

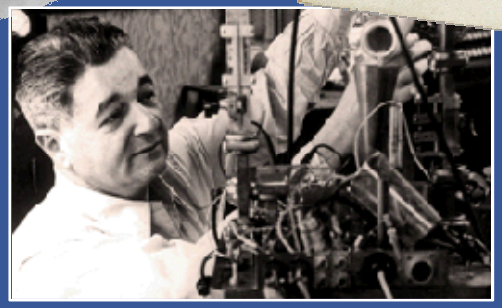
I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

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.



Sandia's sites

Sandia National Laboratories

Albuquerque, New Mexico

Livermore, California

Kauai, Hawaii

Waste Isolation Pilot Plan
Carlsbad, New Mexico

Pantex Plant,
Amarillo, Texas

Tonopah,
Nevada

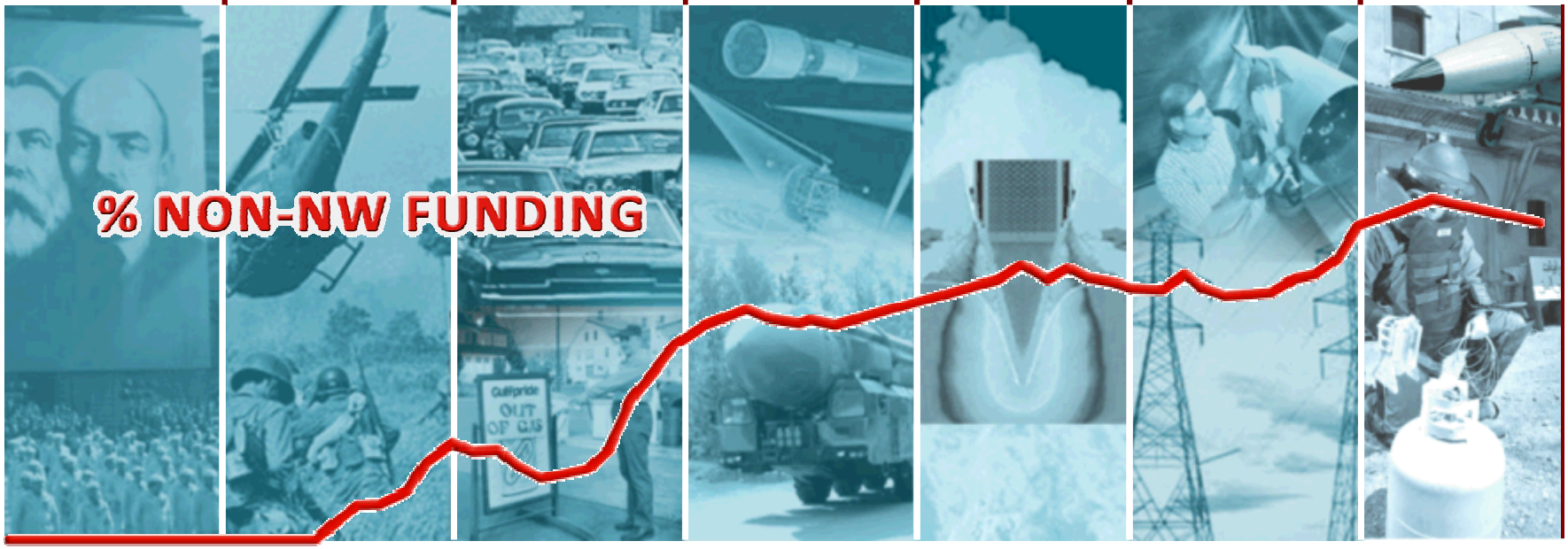
Our core values

- Serve the nation.
- Deliver with excellence.
- Respect each other.
- Act with integrity.
- Team for great results.

Sandia's mission work reflects national security challenges

Sandia National Laboratories

1950s	1960s	1970s	1980s	1990s	2000s	2010s
NW production engineering & manufacturing engineering	Development engineering Vietnam conflict	Multiprogram laboratory Energy crisis	Missile defense work Cold War	Post–Cold War transition Stockpile stewardship	Expanded national security role post 9/11	LEPs New START Evolving national security challenges

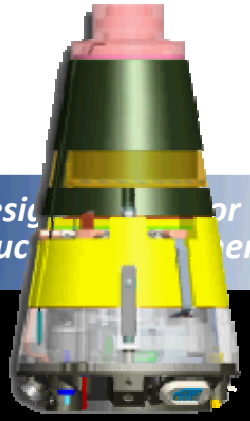


Nuclear Weapons

Sandia National Laboratories

Warhead Systems Engineering and Integration

Desig… or Nonnuc… …ents



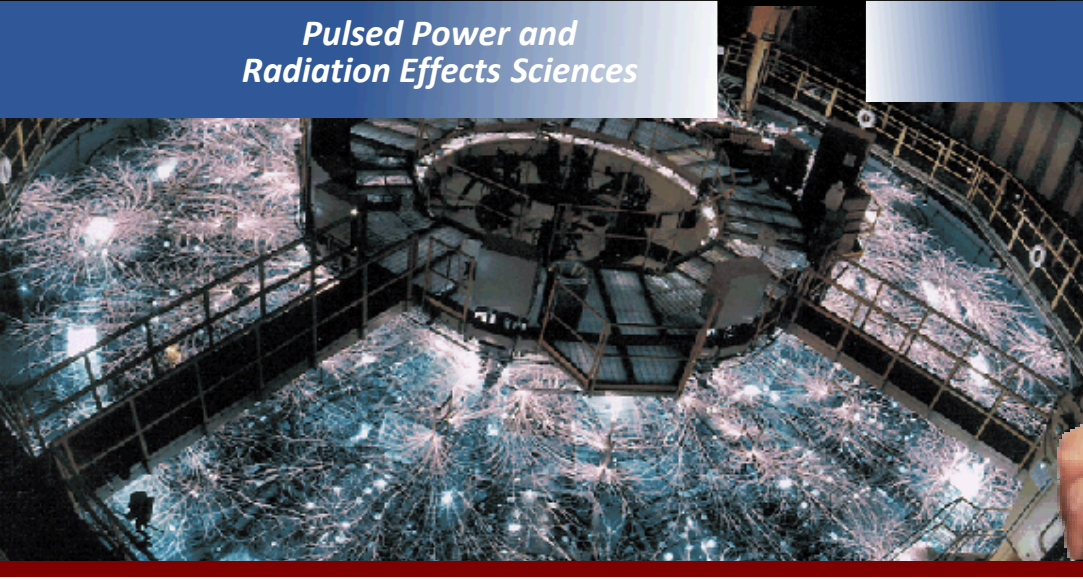
Safety systems

Arming, fuzing, and firing systems

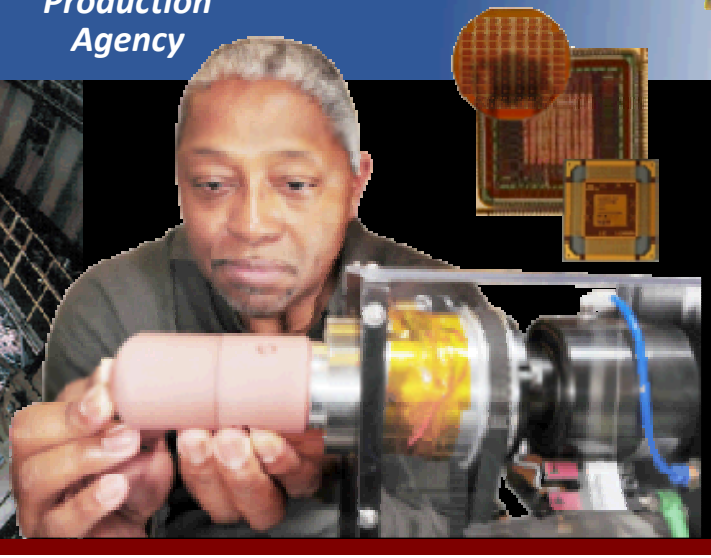
Gas transfer systems

Neutron generators

Pulsed Power and Radiation Effects Sciences

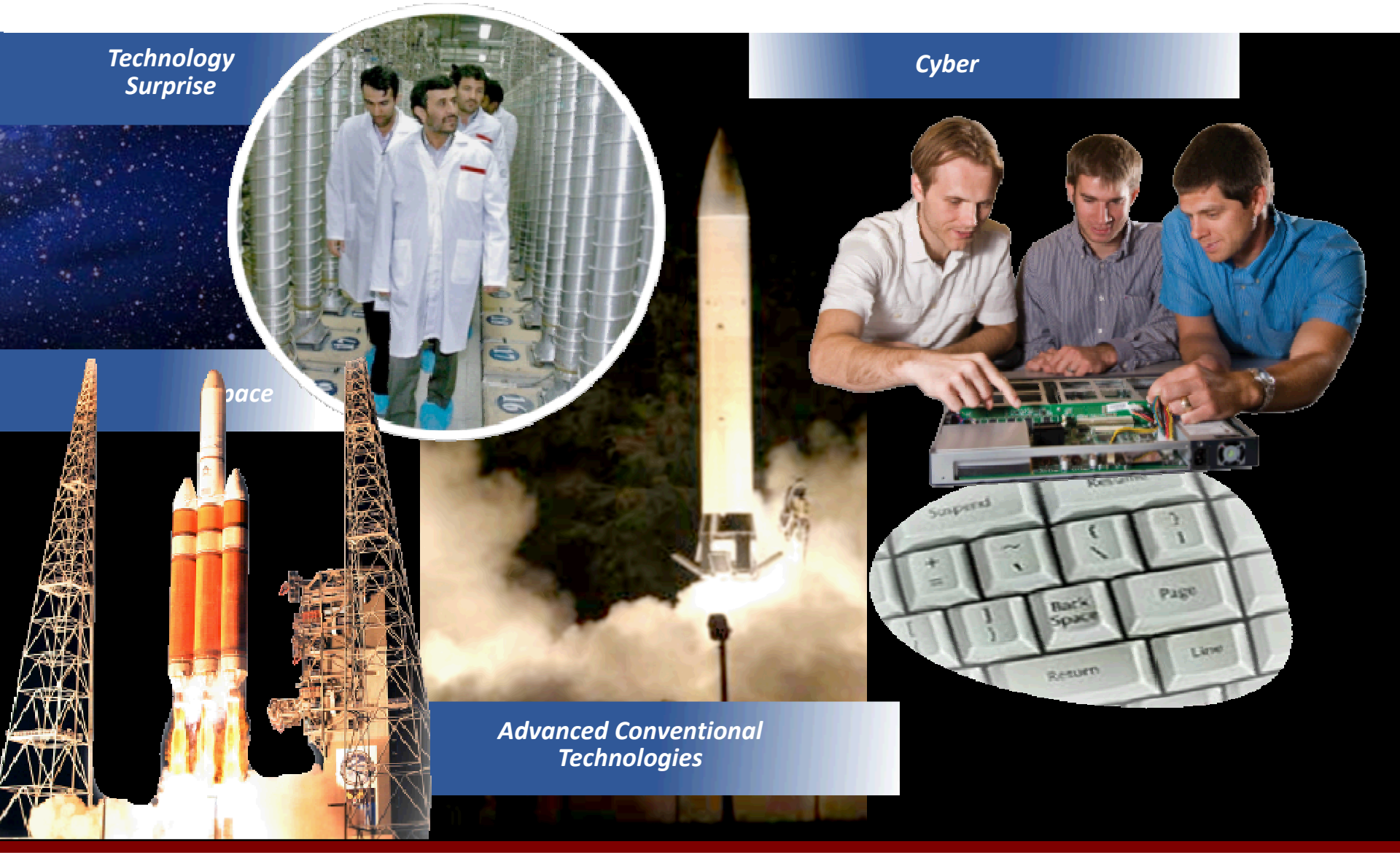


Production Agency



Defense Systems and Assessments

Sandia National Laboratories



International, Homeland, and Nuclear Security

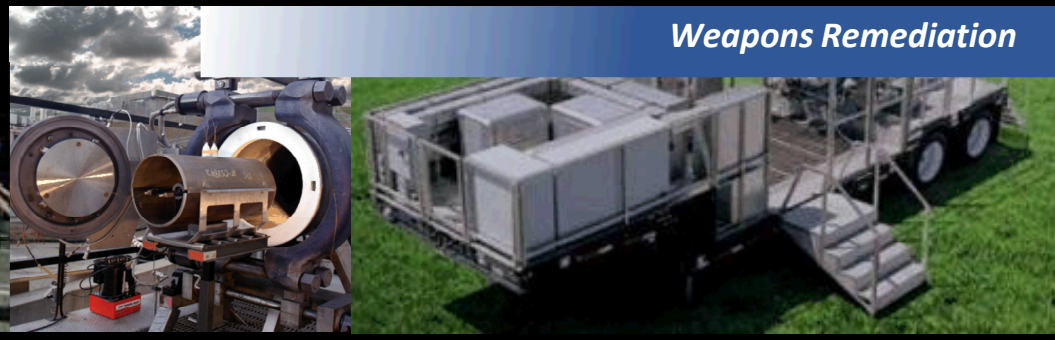
Sandia National Laboratories

Biological and Chemical Security

Emergency Response

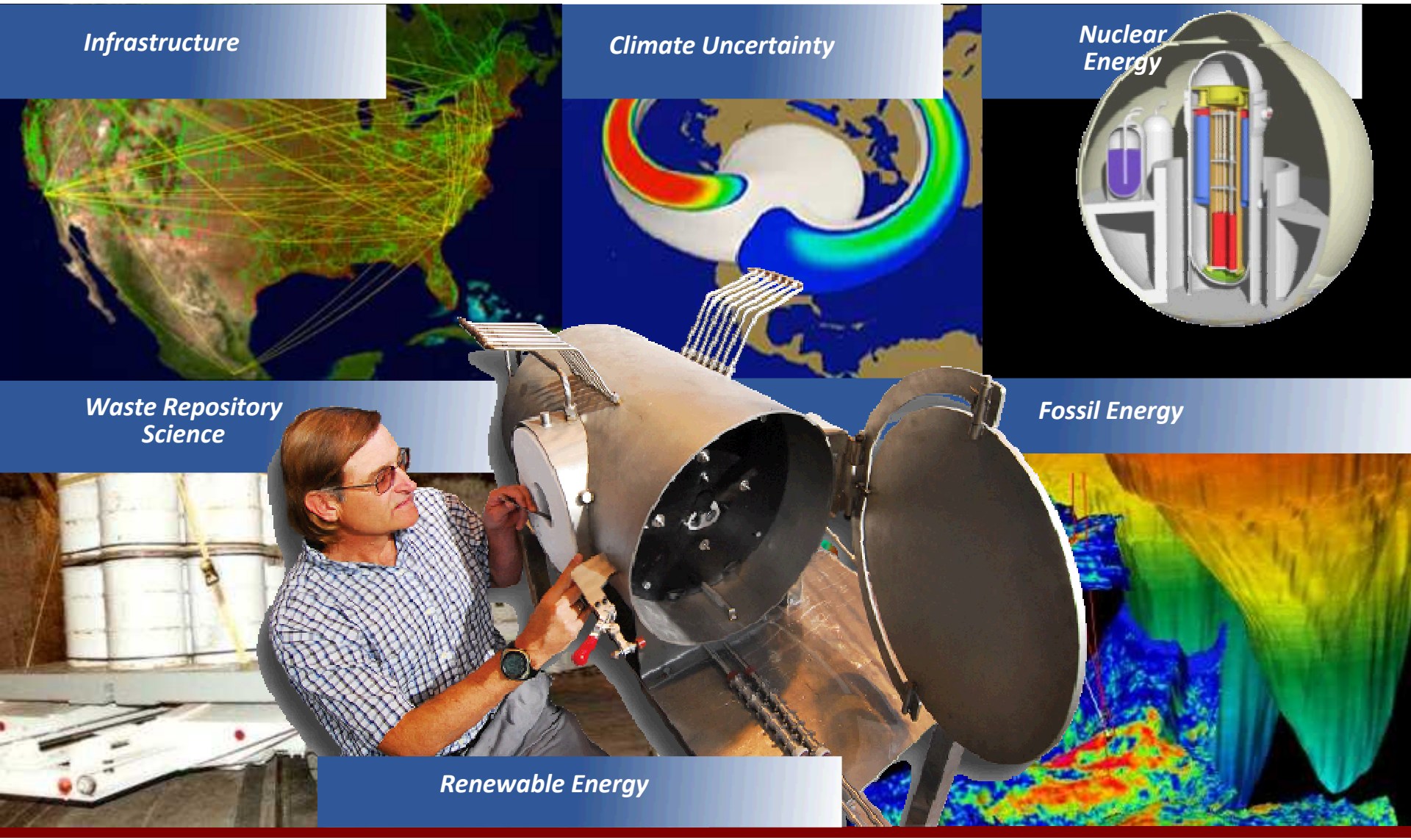
Physical Security

Weapons Remediation



Nuclear and Radiological Threat Reduction

Energy, Climate, and Infrastructure Security



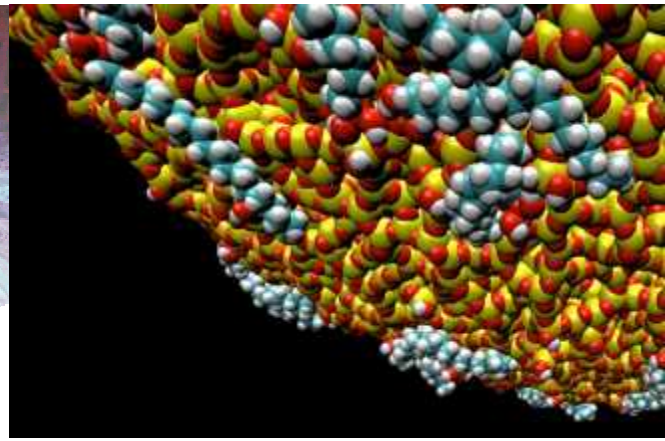
Strong Research Foundations Enable Mission Performance

Sandia National Laboratories

Computing & Information Sciences

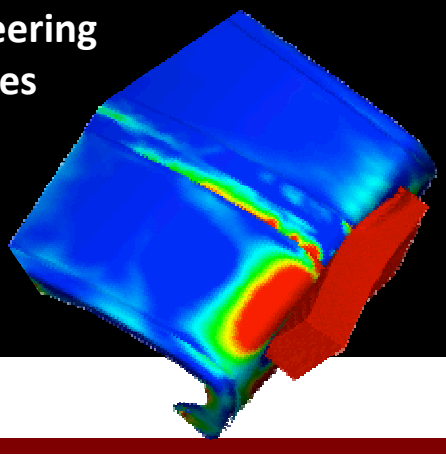
Radiation Effects & High Energy Density Science

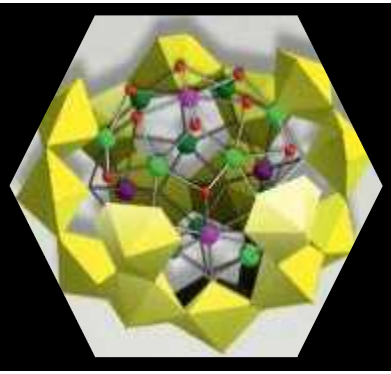
Materials Science

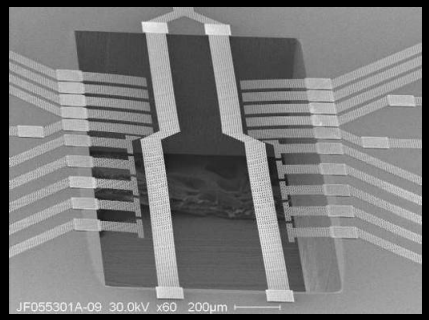


Nanodevices & Microsystems

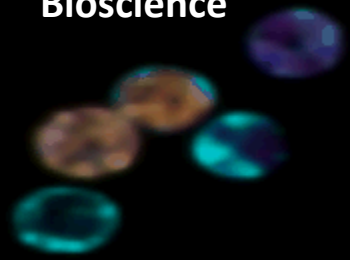
Engineering Sciences







Bioscience



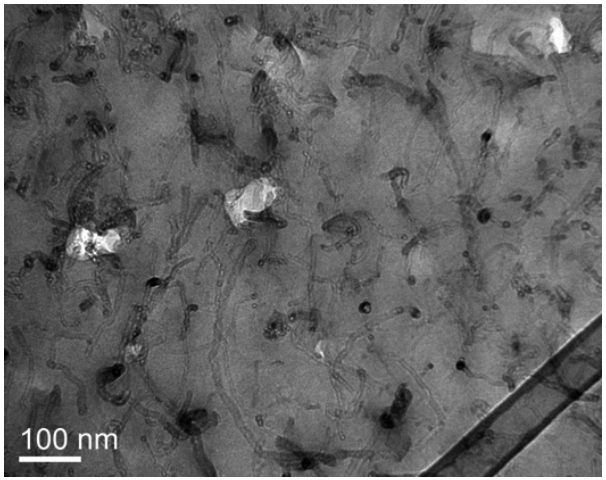
Geoscience

Carbon Nanotube Films

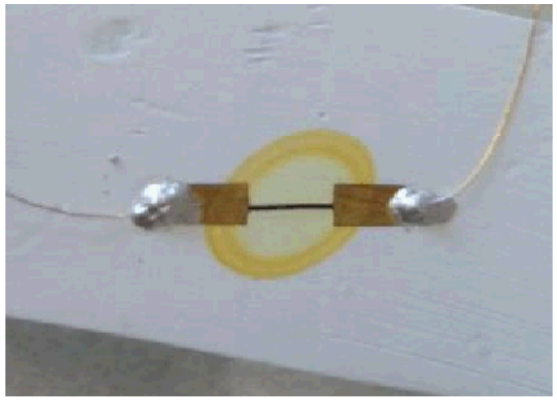
Carbon nanotube thin film materials

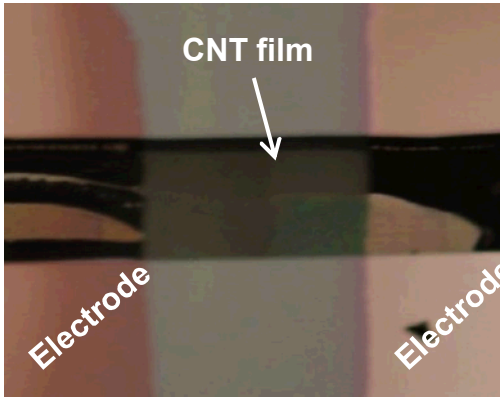
- Thermal management
- Thermoelectric applications
- Infrared and Terahertz detectors
- Conductive paints
- Electromagnetic shielding
- Flexible electronics
- Chemical/fluidic barriers

Conductive CNTs in Latex-based paint



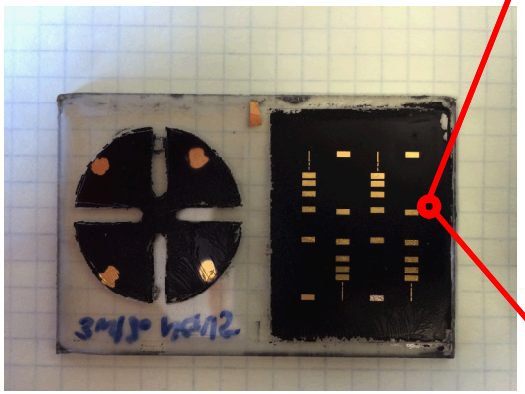
3D reconstruction movie of CNT network in paint



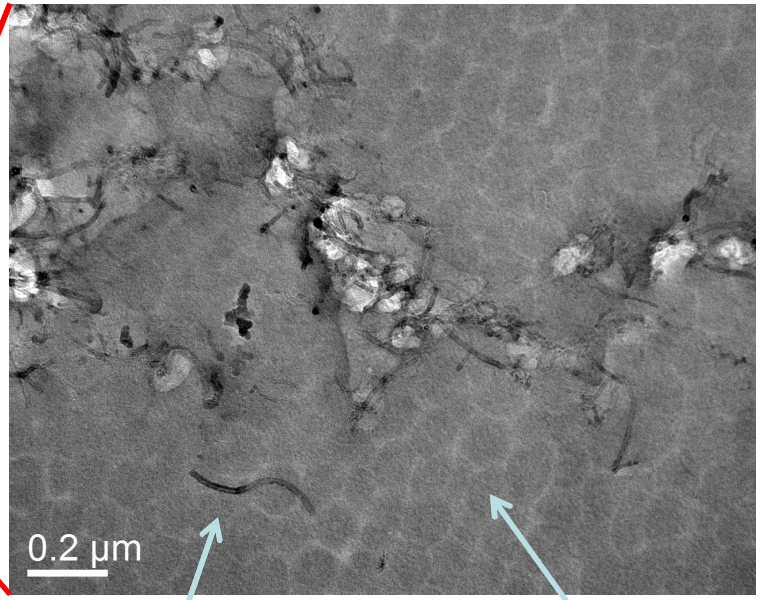


Conductive Carbon Nanotube Coatings

Carbon nanotube filled latex paints for EM shielding



- Water-based
- Low-viscosity
- Sprayable
- Scalable
- Percolation at 2-3 wt.% carbon nanotubes
- Electrical Conductivity is ~1 S/cm
- Can look inside to investigate the 3D nanotube network



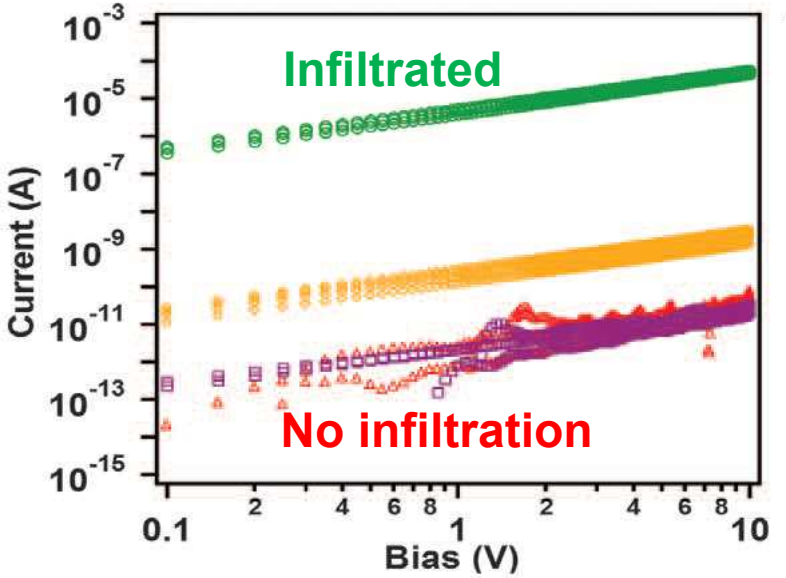
- O'Bryan, G.; Skinner, J.; Vance, A.; Yang, E.; Zifer, T. "Method of making carbon nanotube composite materials," US Patent US20120114841 A1, May 10, 2012.
- O'Bryan, G.; Yang, E. L.; Zifer, T.; Wally, K.; Skinner, J. L.; Vance, A. L. *Journal of Applied Polymer Science* **2011,** 120, (3), 1379-1384.

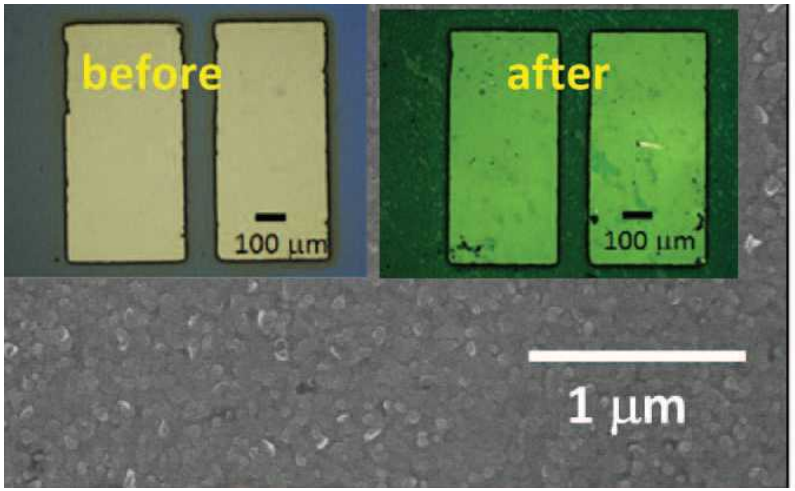
Conductive Metal Organic Frameworks (MOFs)

Sandia National Laboratories

Conductive metal-organic frameworks (MOFs) for electronics

- Air-stable electrical conductivity
- Electrical conductivity increased over 6 orders of magnitude with guest molecule infiltration
- Electrical Conductivity as high as ~ 7 S/m
- Applications in conformal electronics, reconfigurable electronics, sensors





- Talin, A.; Centrone, A.; Ford, A.; Foster, M.; Stavila, V.; Haney, P.; Kinney, A.; Szalai, V.; Gabaly, F.; Yoon, H.; Leonard, F.' Allendorf, M., *Science,* **2014,** 343, 66-69.
- *Patent Pending*

Closing Remarks

- SNL has helped maintain an effective US nuclear deterrent for over 60 years
- We provide timely solutions to a vast array of national security problems
- We rely on world-class science and engineering, and the capability to develop product that meets rigid specifications
- We are always looking for commercial partners like BASF to do collaborative development on new and exciting technologies
- Please stop by our table for more details about these technologies and other technologies that might be of interest to you