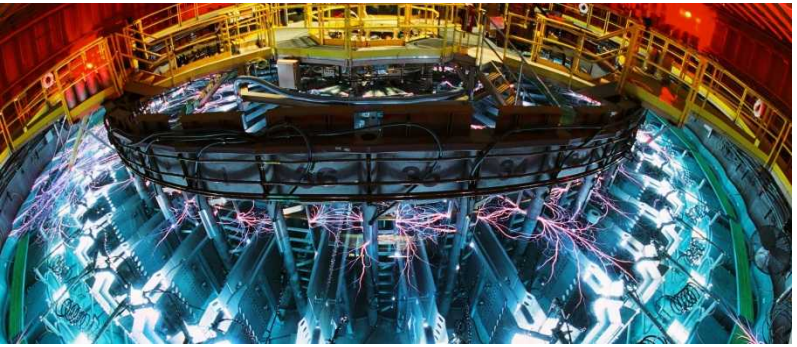
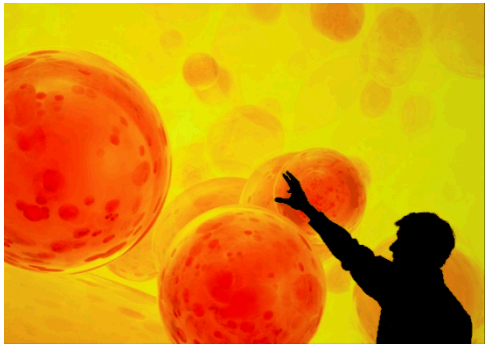
SAND2015-9090PE

Exceptional service in the national interest

Sandia National Laboratories


Sandia's Role in the U.S. Nuclear Weapons Stockpile Stewardship Program

October 27, 2015 - Presented to the Nonproliferation Treaty Transparency Visit

Dr. Gary A. Sanders

Vice President of Weapons Engineering and Product Realization and Chief Engineer for Nuclear Weapons

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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.

Sandia Operates at the Intersection of U.S. National Security Objectives

"The United States will take ***concrete steps*** towards a world without nuclear weapons...

…Make no mistake: As long as these weapons exist, the United States will ***maintain a safe, secure and effective arsenal*** to deter any adversary, and guarantee that defense to our allies..."

President Obama, April 5, 2009
Prague, Czech Republic

NNSA Administrator,
Lt. Gen. Frank G. Klotz, (USAF Ret)
The National Interest, June 27, 2013
"Berlin and the Arms-Control Debate"

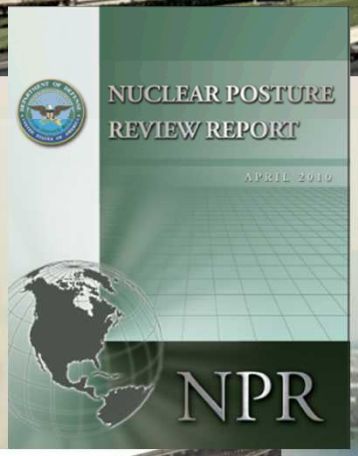
"…the approach taken by President Obama and his administration actually represents a relatively moderate and measured effort to reconcile ***two dominant, but different themes*** In current American thinking about nuclear weapons.

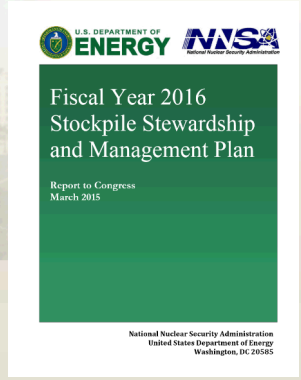
The first is the belief that the U.S. should continue to lead international efforts to ***limit and reduce*** nuclear arsenals, prevent nuclear proliferation, and secure nuclear materials.

The second is the belief that ***appropriately sized nuclear forces still play an essential role*** in protecting U.S. and allied security interests."

National Policy Drives the Definition of Requirements for the Sandia Nuclear Weapons Mission Area

Sandia plays a key role in the principle of extended deterrence





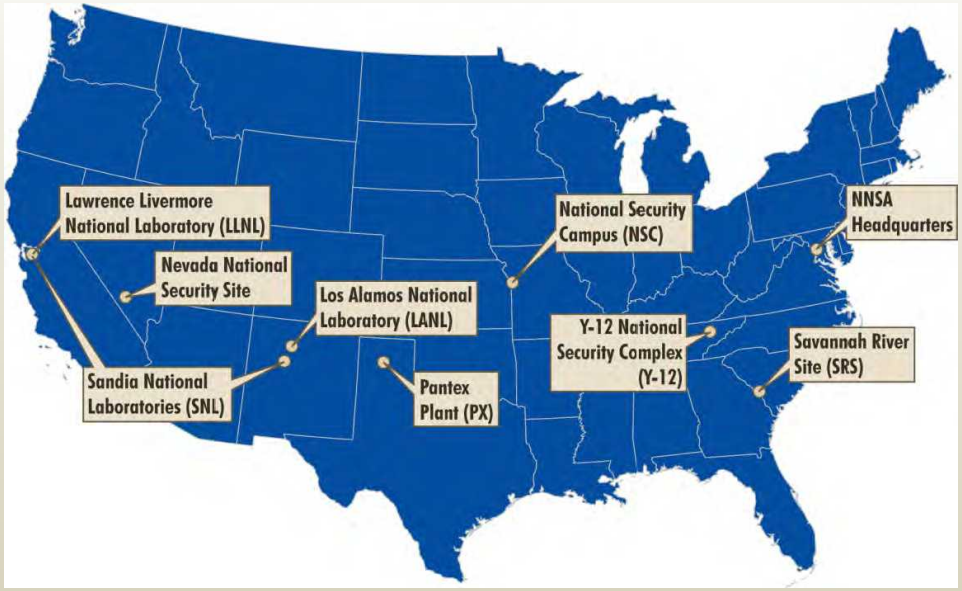
Infrastructure Modernization

A Smaller, More Responsive Nuclear Security Enterprise

Sandia National Laboratories

Lawrence Livermore National Laboratory
- Nuclear Explosive Package Design Agency
- National Ignition Facility

Nevada National Security Site
- Hydrodynamic Testing
- Subcritical Pu Experiments
- Special Nuclear Material Operations at Device Assembly Facility (DAF)



Savannah River Site
- Tritium Production R&D and Supply Management

Y-12 National Security Complex
- Highly Enriched Uranium (HEU) Storage and R&D
- Uranium Processing Facility (UPF)

National Security Campus
- Non-Nuclear Component Production

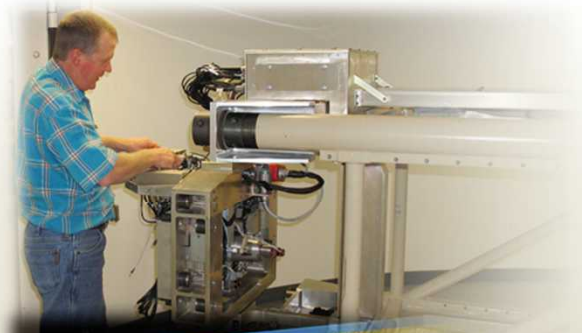
Sandia National Laboratories
- Warhead Systems Engineering and Integration
- Non-Nuclear Component Design Agency
- Production Agency for Specialized Components
- Pulsed Power Z Machine

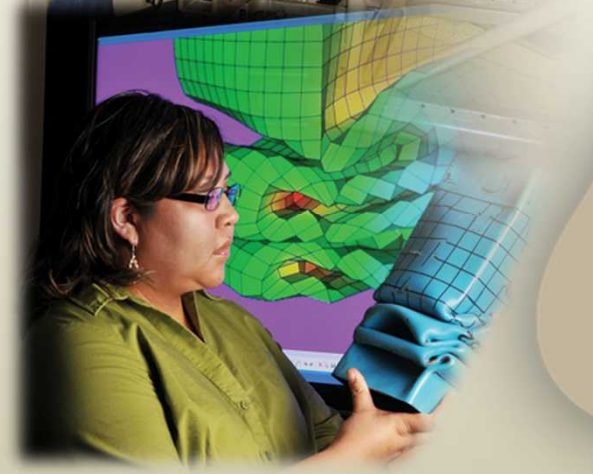
Los Alamos National Laboratory
- Nuclear Explosive Package Design Agency
- Pit Production and Plutonium Sustainment Strategy

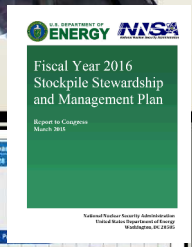
Pantex Plant
- Full Warhead Assembly/Disassembly
- High Explosive Production and Machining
- Weapon Surveillance

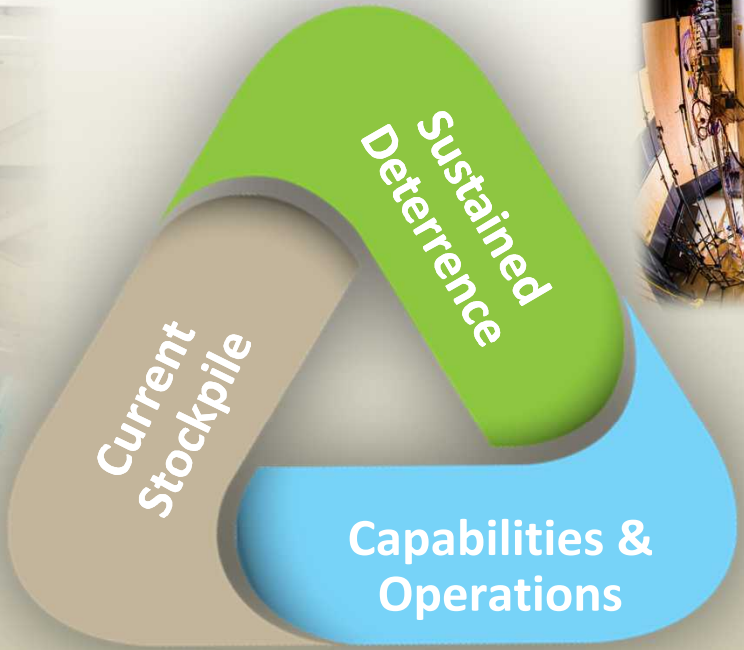
Nuclear Weapons

Maintaining the safety, security, and effectiveness of the existing stockpile









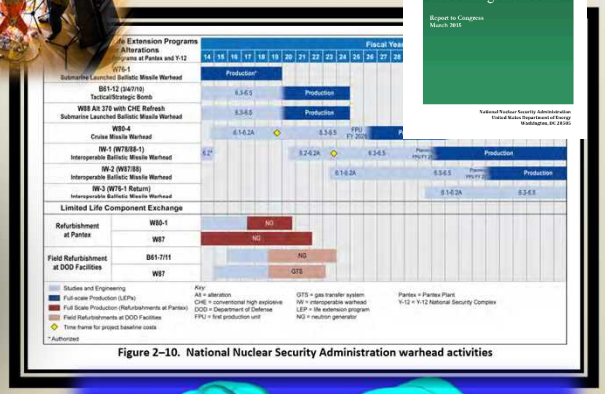
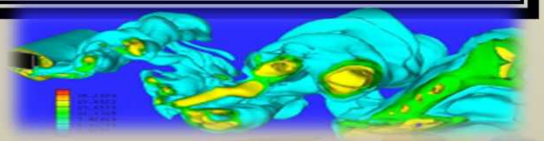
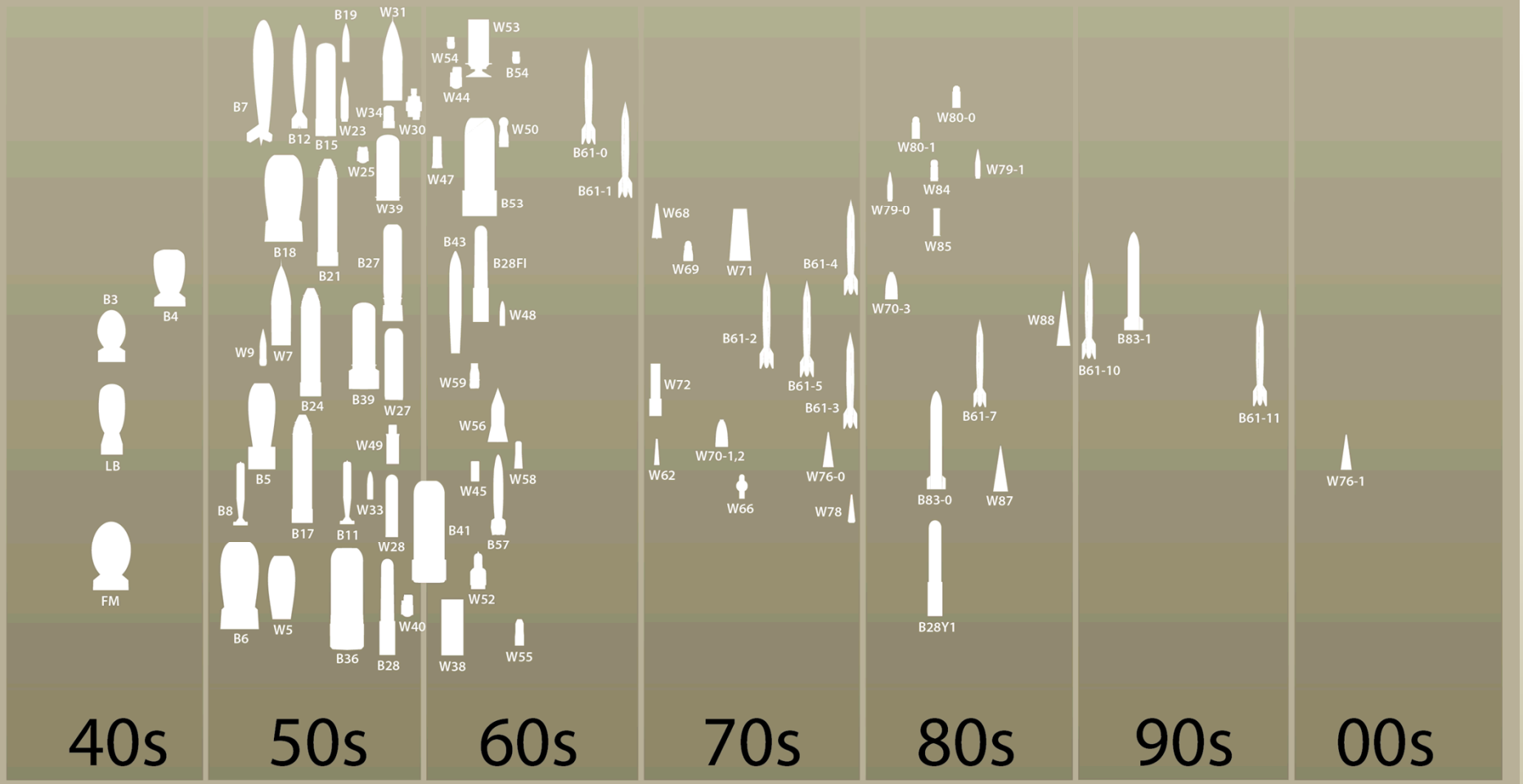


Figure 2–10. National Nuclear Security Administration warhead activities



Stockpile Milestones

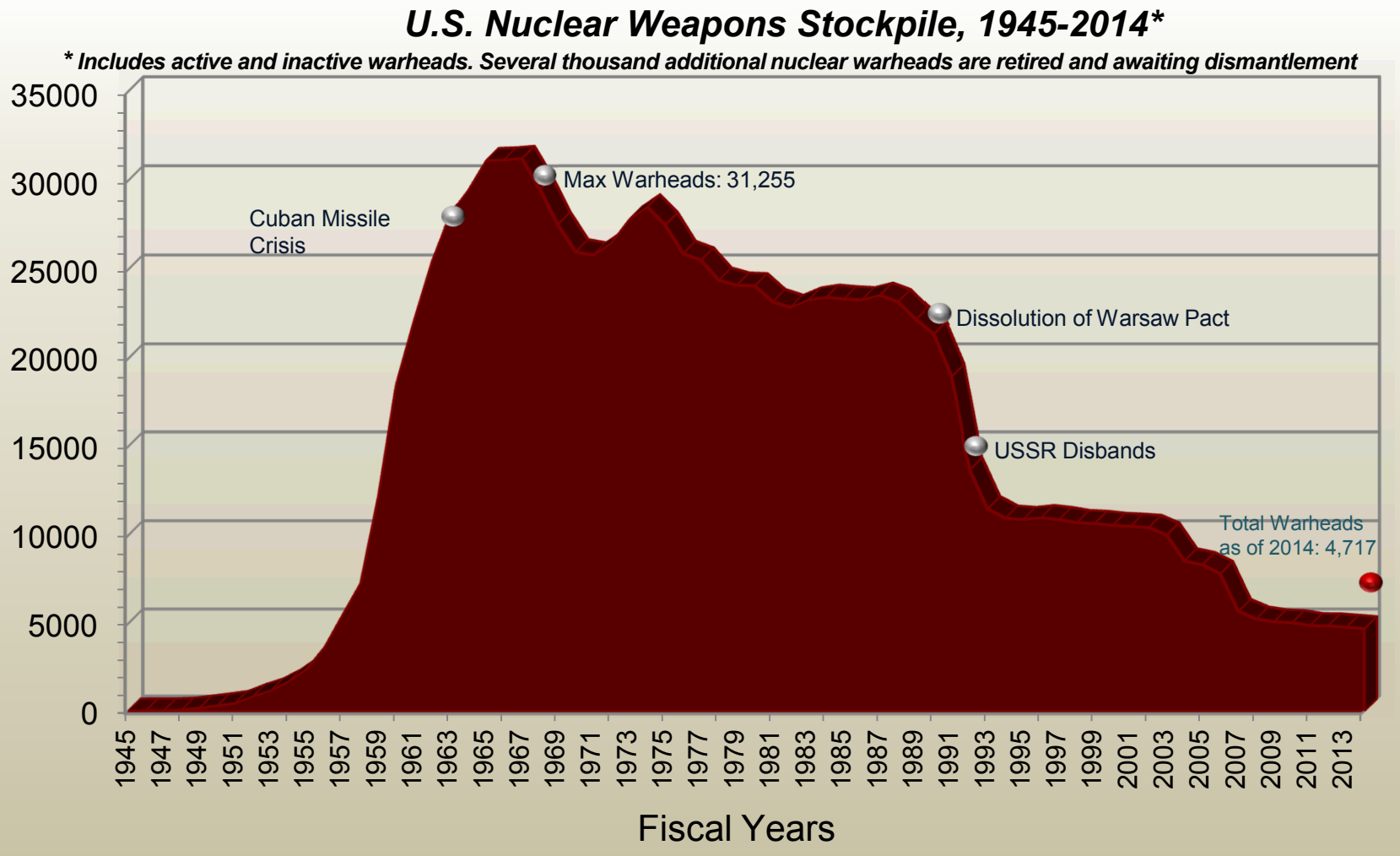
Sandia National Laboratories



Weapons shown at date of stockpile entry

Evolution of the Stockpile

Sandia National Laboratories



Not a linear relationship between weapons and budget. Unforeseen issues will impact a greater fraction of the stockpile as it is reduced.

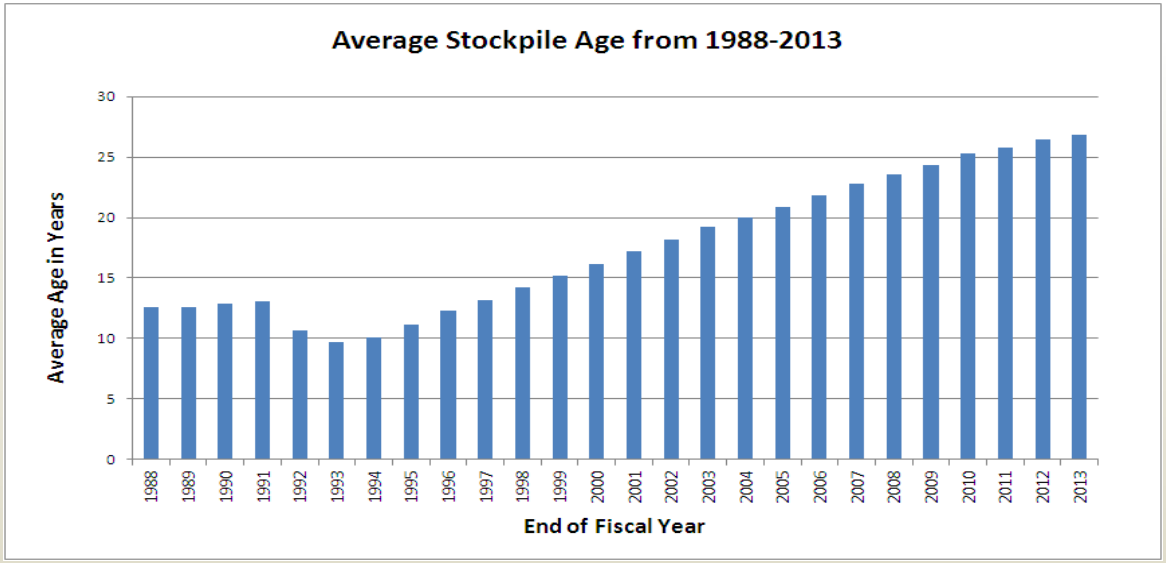
Sustaining a Safe, Secure and Effective Nuclear Arsenal

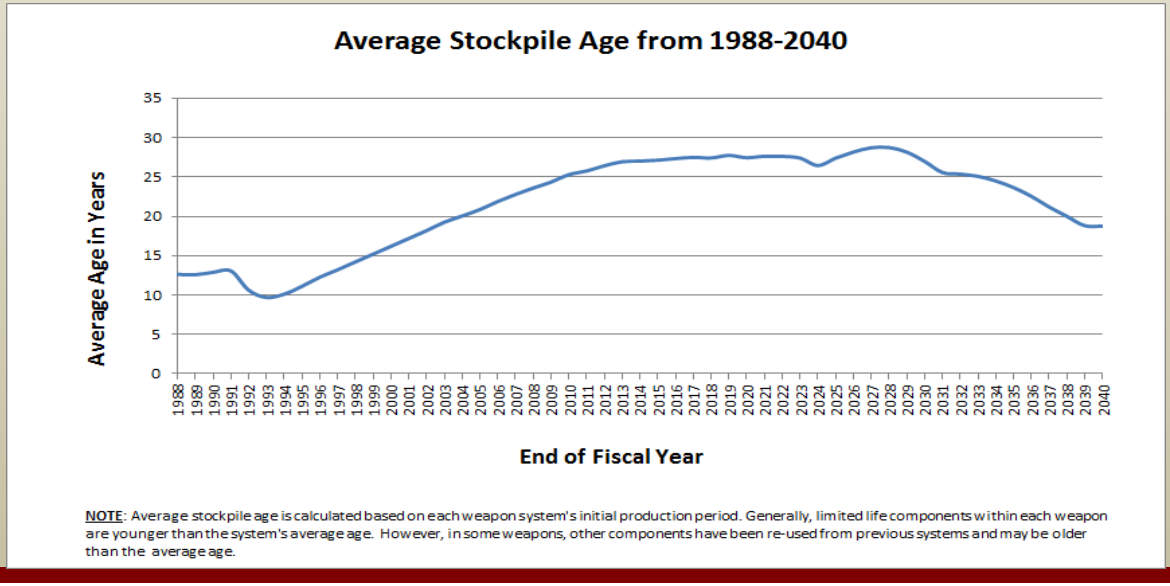
Sandia National Laboratories

- The United States is committed to ensuring that its nuclear weapons remain safe, secure, and effective. Since the end of U.S. nuclear testing in 1992, our nuclear warheads have been maintained and certified as safe and reliable through a Stockpile Stewardship Program that has extended the lives of warheads by refurbishing them to nearly original specifications.
- The United States will not conduct nuclear testing and will pursue ratification and entry into force of the Comprehensive Nuclear Test Ban Treaty.
- The United States will not develop new nuclear warheads. Life Extension Programs (LEPs) will use only nuclear components based on previously tested designs, and will not support new military missions or provide for new military capabilities.

Stockpile Age and Size

- Currently, the U.S. stockpile is the oldest it has ever been, with an average weapon life greater than 27 years
- The U.S. is currently maintaining its smallest stockpile since the Eisenhower administration
  - Since reaching a peak of 31,255 weapons in 1967, the stockpile has been reduced by approximately 85 percent
  - In April 2014, the United States reported that its total nuclear weapons stockpile as of September 30, 2013, had been reduced to 4,804 warheads

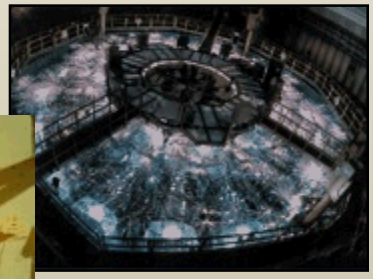




Modernization is Key to Reduction

- By pursuing a sound Stockpile Management Program for extending the life of U.S. nuclear weapons, we can ensure a safe, secure, and effective deterrent without the development of new nuclear warheads or further nuclear testing.
- By modernizing our aging nuclear facilities and investing in human capital, we can substantially reduce the number of nuclear weapons we retain as a hedge against technical or geopolitical surprise, and accelerate dismantlement of retired warheads.

Major Environmental Test Facilities and Diagnostics

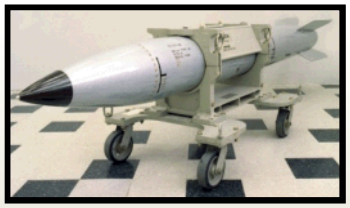


Z Machine

Light Initiated High Explosive

Annular core research reactor

B61-12 Life Extension Program (LEP)



Tactical
- **B61-3**
- **B61-4**
- **B61-10**

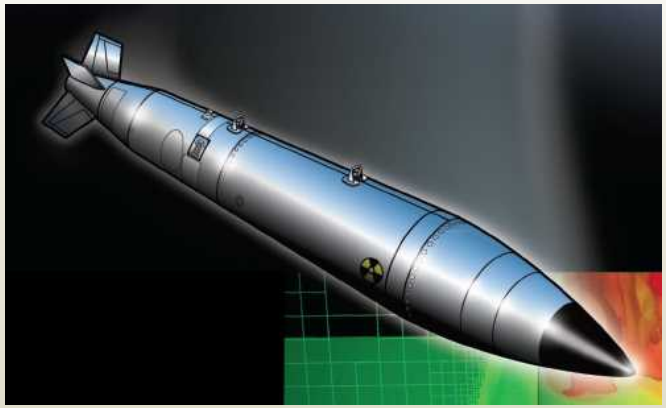
Strategic
- **B61-7**

Consolidate (1 LEP)

Strategic
- **B83-1**

No LEP

B61-12
Tactical/Strategic



- The "3+2" strategy consolidates nuclear weapon types from twelve to five
  - The first implementation element is the B61-12 Life Extension Program
    - Consolidates four variants into one
    - Improves both safety and security of the oldest weapon system in the U.S. arsenal
    - No change to overall military requirements
    - B61 remains an essential element of the air-delivered leg of the U.S. deterrent and is a key weapon system in the extended nuclear deterrent
    - Once the B61-12 has garnered appropriate confidence, the B83 (last megaton-class weapon in U.S. arsenal) will be retired
    - The combination of these activities will result in:
      (1) a reduction of the number of bombs by a full factor of two
      (2) a reduction in nuclear material of more than 80% in the bomb portion of the air leg, and
      (3) a reduction in overall destructive power by a commensurate factor.

Assuring a Safe, Secure, & Effective Stockpile

Current Stockpile

- Responsible to ensure that a nuclear weapon will ***always*** work as intended when called upon by the U.S. president…and ***never*** work under any other circumstances
- Shaped by the legacy of our Laboratories' pioneers

"Always/Never"

Annual Assessment

Always/Never Documentary:
https://www.youtube.com/watch?v=DQEB3LJ5psk&list=PLouetuxaIMDrht4F8xiS4AY-oLvCq77aA

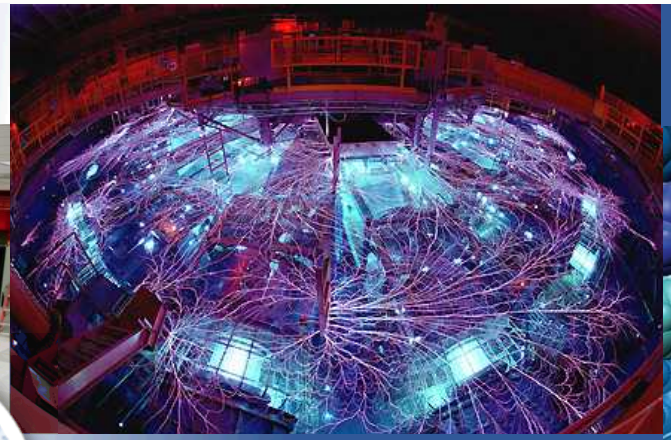
Sandia's Research Foundations

Enduring discipline-based competencies essential to our mission

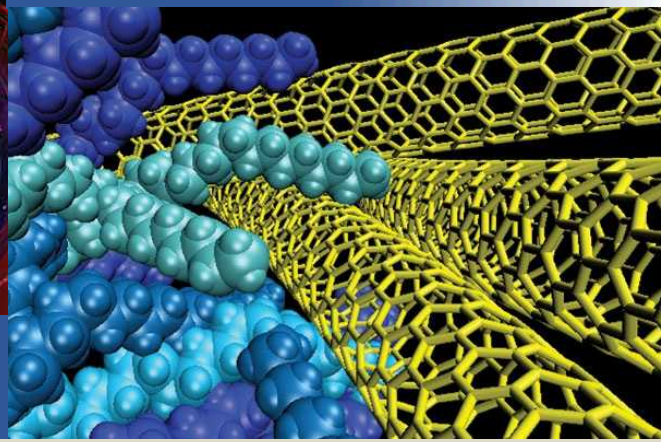
Sandia National Laboratories

Computing & Information Sciences

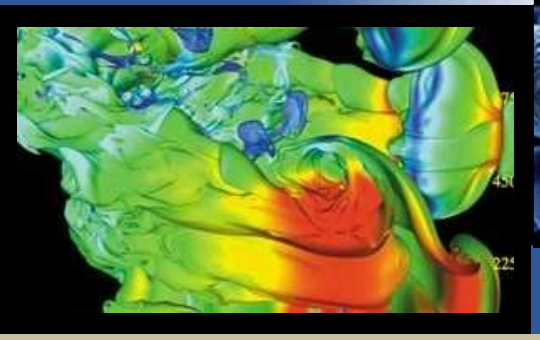
Radiation Effects & High Energy Density Science



Materials Sciences

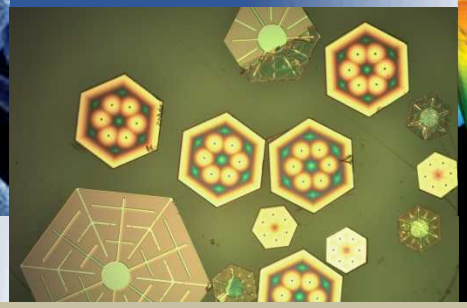


Engineering Sciences

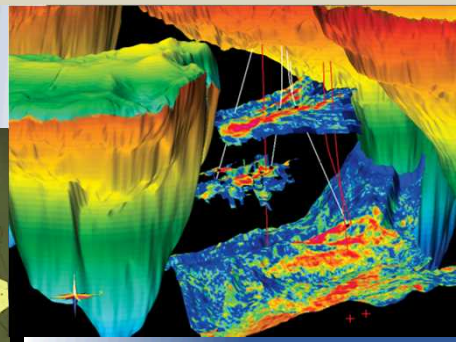


Bioscience

Nanodevices & Microsystems



Geoscience



Conclusion

Sandia is maintaining and refurbishing the U.S. nuclear weapons stockpile through a deep scientific understanding of the technologies supporting safe, secure, and effective legacy weapons so that underground nuclear testing will not be required.

Legacy warhead refurbishment efforts focus on modernizing the inherent safety, security, and effectiveness needed for the U.S. and its allies to have confidence in a smaller stockpile.

Sandia National Laboratories

Q&A