Los Alamos
NATIONAL LABORATORY

Perspectives from Los Alamos

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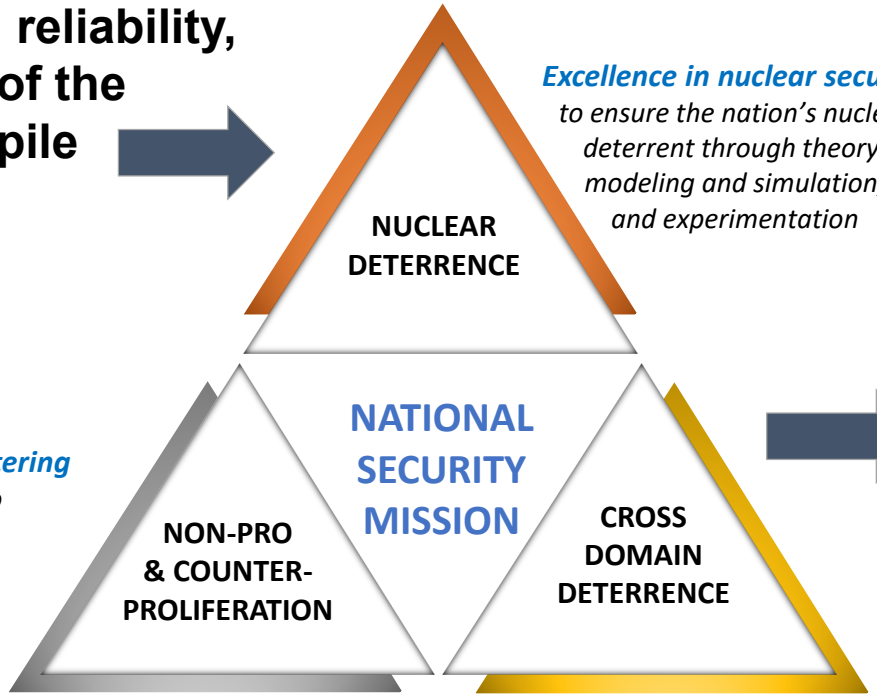
NNSA National Nuclear Security Administration
Managed by Triad National Security, LLC., for the U.S. Department of Energy's NNSA

Our national security mission is broad and important
— and motivates and is enabled by ST&E discovery

Ensure the safety, reliability, and performance of the U.S nuclear stockpile

- Physics & Design
- Engineering
- Production



Excellence in nuclear security *to ensure the nation's nuclear deterrent through theory, modeling and simulation, and experimentation*

Preventing and countering *efforts of proliferants to acquire, develop or disseminate materials and expertise necessary for nuclear weapons*

Energy security

- Sustainable Nuclear Energy
- Resilient Materials
- Complexity in Energy Systems

Supporting *the DoD, IC, and other national security partners to execute multidomain operations across land, air, sea, space, and cyber*

Our capability pillars define six key areas of science, technology & engineering, in which we must lead

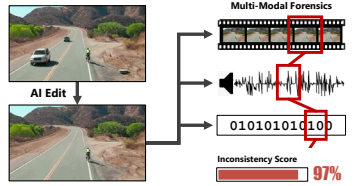
CAPABILITY PILLARS	
MATERIALS FOR THE FUTURE	Defects and Interfaces Extreme Environments Emergent Phenomena
NUCLEAR AND PARTICLE FUTURES	Applied Nuclear Science & Engineering Nuclear & Particle Physics, Astrophysics & Cosmology Accelerator Science & Technology High Energy Density Physics & Fluid Dynamics
INTEGRATING INFORMATION, SCIENCE, AND TECHNOLOGY FOR PREDICTION	Computing Platforms Computational Methods Data Science
SCIENCE OF SIGNATURES	Nuclear Detonation Nuclear Processing, Movement, Weaponization Natural and Anthropogenic Phenomena
COMPLEX NATURAL AND ENGINEERED SYSTEMS	Human–Natural System Interactions: Nuclear Engineered Systems Human–Natural System Interactions: Non-Nuclear
WEAPONS SYSTEMS	Design Manufacturing Analysis

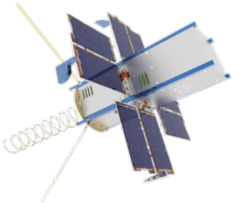
Our Laboratory Strategy starts with simultaneous excellence:
Balance between operations and mission

SIMULTANEOUS EXCELLENCE	1.0 NUCLEAR SECURITY	2.0 MISSION-FOCUSED SCIENCE, TECHNOLOGY & ENGINEERING	3.0 MISSION OPERATIONS	4.0 COMMUNITY RELATIONS
Strategic Objective (10–20 years)	Excellence in Nuclear Security	Excellence in Mission-Focused Science, Technology & Engineering	Excellence in Mission Operations	Excellence in Community Relations
Critical Outcomes (5–10 years)	Design, produce, and certify current and future nuclear weapons and reduce global nuclear threats	Deliver scientific discovery and technical breakthroughs that support DOE and NNSA missions	Execute sustained operations that are reliable and responsive to mission needs	Sustain and enhance LANL's partnership with the community across the Northern New Mexico region
Major Strategic Initiatives (1–5 years)	1.1 Execute LANL's Manufacturing mission to deliver 30 plutonium pits per year 1.2 Transform nuclear weapons warhead design and production 1.3 **Anticipate threats to global security; develop and deploy revolutionary tools to detect, deter, and respond** 1.4 Support modernization of LANL warhead systems 1.5. Assess the stockpile as it ages and project weapon systems lifetimes	2.1 Refresh and refine the LANL capability pillar framework 2.2 Advance accelerator science, engineering, and technology to enable future stewardship capabilities 2.3 Advance the frontiers of computing to exascale and beyond 2.4 Assert leadership in the national quantum initiative 2.5 **Develop and implement an integrated nuclear energy and nuclear materials initiative** 2.6 Implement an integrated initiative for plutonium and actinide missions based on FY20 strategy 2.7 **Implement a national security life sciences initiative**	3.1 Change organizational culture with an emphasis on organizational learning 3.2 Improve integrated planning across priority mission activities and infrastructure 3.3 Address critical issues related to NMCA, nuclear safety, criticality safety, waste, and classified enhancements 3.4 Implement systematic process improvement to drive increased rigor and efficiency in work execution 3.5 Enhance quality of work life, workforce planning, and training and development	4.1 Continue commitment to the community with educational, economic, and philanthropic investments of time and resources 4.2 Strengthen pipelines and partnerships to build workforce of the future 4.3 Enhance small business participation in executing LANL scope across all directorates 4.4 **Demonstrate agility and flexibility in our partnerships, effectively balancing benefit and risks**

Anticipate threats to global security; develop and deploy revolutionary tools to detect, deter, respond

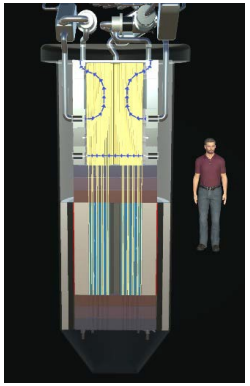
- **Deliver on NNSA and Strategic Partnership Projects supporting non-proliferation, counter-proliferation, and emerging threats**
  - Develop & transition data analytics tools
  - Execute programs for advanced reactors and power systems
  - Support NC3 resiliency
  - Operational support to Combatant Commands for enhanced effectiveness and ISR capabilities
  - Large-scale field experiments and testbeds to verify scientific modeling
  - Advanced technologies (e.g., unique sensing and exploitation) supporting counter-pro/counter-adversary capabilities
- **Support non-proliferation and cross-domain deterrence through integrated space domain strategies**
  - Protection of space-based systems in natural and contested environments
  - Resilient space architectures for national security missions
  - Space-based remote sensing
- **Advance virtual training concepts for Lab's and partner agencies' operational mission needs**





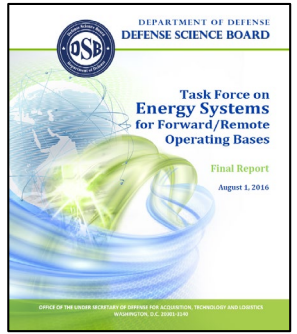
LANL nuclear science enabling DOD missions

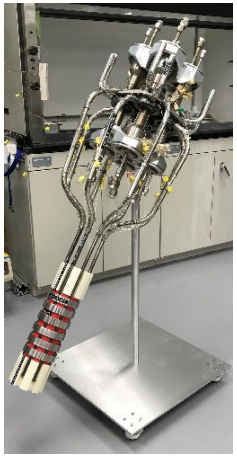
- **Integrated nuclear energy and nuclear materials initiative**
  - Power sources
  - Isotope production
  - Special-purpose reactors
  - Modeling & simulation
- **Technology demonstration using LANL's unique facilities, skilled personnel, and capabilities**
  - Advanced fuel qualification
  - Heat pipe technology
  - Nuclear demonstration capability



2010 LANL internal R&D investment results in mobile reactor design for DoD use

2016 LANL provides input and guidance to DSB task force on energy systems



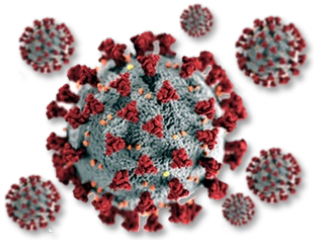


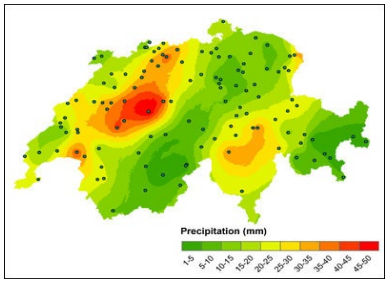
2018 LANL/NASA conducts first US nuclear demonstration in decades – Core physics and feasibility established

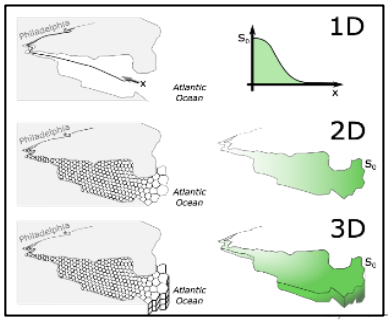
2020 LANL supports SCO PELE program for prototype demonstration of mobile nuclear power for the DoD

National Security Life Sciences Initiative

- **Timely scientific and technical assistance to national security partners**
  - National security life sciences contributing to pandemic science and response
- **Leadership in national bio-defense and international-level bio economy strategy and planning**
- **Continued excellence in physics-based modelling**
  - High fidelity climate modelling coupled with physics-based infrastructure modelling – focus on regional impacts
  - Forecasting impact and informing mission adaption strategies (e.g. Artic strategy development)







Los Alamos delivers national security mission solutions

- By applying multidisciplinary science, technology & engineering capabilities, in unique experimental, computational, and nuclear facilities
- With an agile, responsive, and innovative workforce
- Dedicated to addressing complex national security issues and the world's most difficult challenges
- Partnering with like-minded colleagues for mission success