“UCI-National Labs Connections”

Inaugural event w/
Los Alamos National Lab
@ UCI
Dec 2&3, 2021

Introduction by:
Efi Foufoula-Georgiou,
Associate Dean of
Research and Innovation,
Samueli School of Engineering

UCI

"UCI-National Labs Connections" Initiative

Goal:
Connect UCI faculty and students across disciplines and across schools to the National Labs to increase collaboration, educational opportunities, and workforce development in critical areas of research of national interest.

+ …

Motivated by a bigger vision….

SoCal National Labs Hub = “SoCal Hub”

Realization:
-- Currently, there are more opportunities for the north CA campuses to interact with NLs due to proximity and investment
-- Building a similar level of interaction between SoCal UCs and NLs is desirable to advance research and workforce development for the benefit of all.

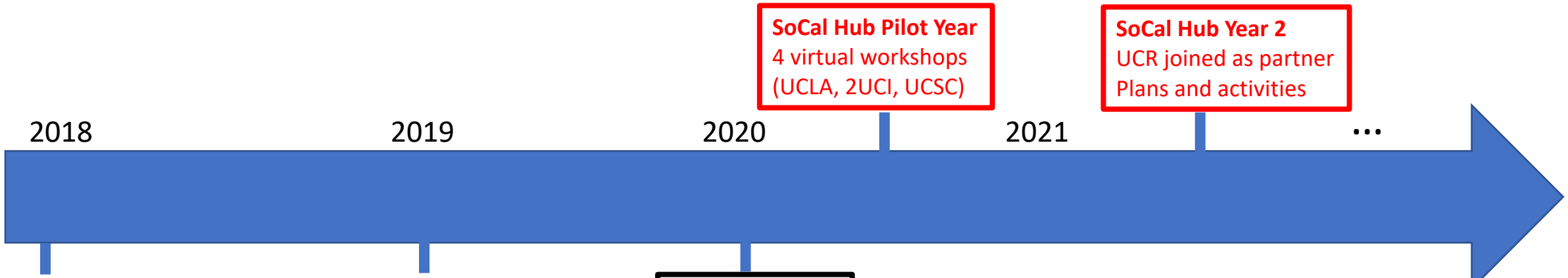
LANL

The time has come for a “SoCal Hub”

… to enhance research and educational opportunities between Southern UC campuses and UC managed National Laboratories in areas of national interest

“SoCal Hub” is spearheaded by UCI VCR Pramod Khargonekar, VCRs of other SoCal campuses and the Deputy Directors of the UC managed labs (see next slide).

“SoCal Hub” Concept Evolution



Leadership of UCOP/UCNL visit to UCI; initial ideas formed

Visioning & planning sessions by faculty & leadership of UCI, UCLA, UCSD, LLNL, LANL, and LBNL

Proposal for a pilot year submitted to UCNL by **UCI, UCLA, UCSD, LLNL and LANL**

Pilot funding awarded by the Regents in Jan. 2020.

SoCal Hub Year 2
Fund “seedling” proposals to expand collaborations
Convene new and follow-on workshops
Enhance engagement of UC students, Lab staff visits, and recruiting
Develop plan for Hub strategy, governance, and communications

SoCal Hub Pilot Year Workshops
1. Nuclear and Materials Collaborations Workshop (UCLA)
2. Frontiers in Machine Learning for the Physical Sciences (UCI)
3. Computational Mechanics & Sciences Virtual Workshop (UCSD)
4. Pipeline and Recruiting Workshop (UCI)

Research at LANL: Opportunities for UCI faculty and students

Dr. John Sarrao
Deputy Director for Science, Technology and Engineering, LANL

December 2, UCI

UCI-NLs Connections Forum – Day 2

Theme 1: Climate and environmental systems modeling

(Co-leads: UCI: Tirtha Banerjee, Efi Foufoula-Georgiou, and Jim Randerson; LANL: Andy Wolfsberg)

*Includes prediction of **regional extremes** such as floods, droughts and fires, climate change impacts in vulnerable environments such as **coasts and the arctic**, watershed and **ecosystem management solutions**, **AI/ML for global climate modeling**, and climate adaptation strategies.*

Theme 2: Renewable energy research, development and deployment

(Co-leads: UCI: Iryna Zenyuk, Plamen Atanassov, and Jack Brouwer; LANL: Rod Borup)

*Includes **clean energy technologies**, fuel cells, **hydrogen production and storage**, **high energy physics**, and **hard-to-decarbonize materials.***

Theme 3: Materials and chemical research

(Co-leads: UCI: Lorenzo Valdevit, Stacy Copp, and Voja Stamenkovic; LANL: Andrew Dattelbaum)

*Includes materials of the future, **performance and controllability**, nanomaterials, manufacturing science, electrochemistry, **materials for renewable energy and extreme environments**.*

Los Alamos NATIONAL LABORATORY

Research at Los Alamos National Laboratory and Opportunities for UCI Faculty and Students

John Sarrao
Deputy Director, Science, Technology & Engineering

Dec. 2, 2021

LA-UR-21-29547

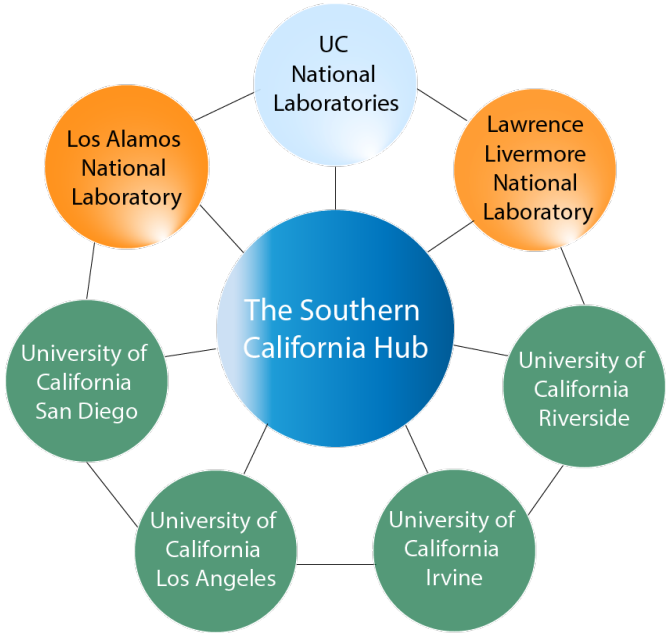
Outline
- Some facts & figures
- Our mission (what)
- Our strategy (why)
- Discussion

By way of introduction…

- UC Irvine was the first UC I knew (Grew up in Mission Viejo)
- Undergrad: Stanford; Grad Student: UCLA
  - First exposure to National Lab: LLNL, ~ two weeks, ~1988
  - First exposure to LANL: Summer, 1990
  - “Grad school” @ LANL 6/91 - 12/93
- Postdoc: UCSD … Magnet Lab @ Florida State University
- LANL: 1997-present
  - Full-time research, 1997 - ~2002
  - Part-time research, 2002 - ~2007
  - Zero-time research (i.e., Full-time Manager), 2007 →
    - Materials research; Program Manager & Scientific Facility planning; Theory, Simulation & HPC
    - Today: Deputy Director: ~ 4,000 people; ~ $2B/year

Long-term future of the UCNL Southern California Hub

- Faculty from UC southern campuses and researchers from UC managed national Labs collaborate for high-impact science and engineering research and advance national and state agendas.
- Create pathways for other UC campuses and LBNL to join SoCal Hub activities.
- Harness the great commitment to diversity and inclusion at UC campuses to educate a diverse workforce of scientists and engineers for work at national labs.
- A robust financial model with base support from UCOP and grants from external sources.
- Leveraging of virtual collaboration tools for greater effectiveness of the Hub.



Our Goal: Realizing the Potential of the SoCal Hub

What defines success?

The mature SoCal Hub will be:

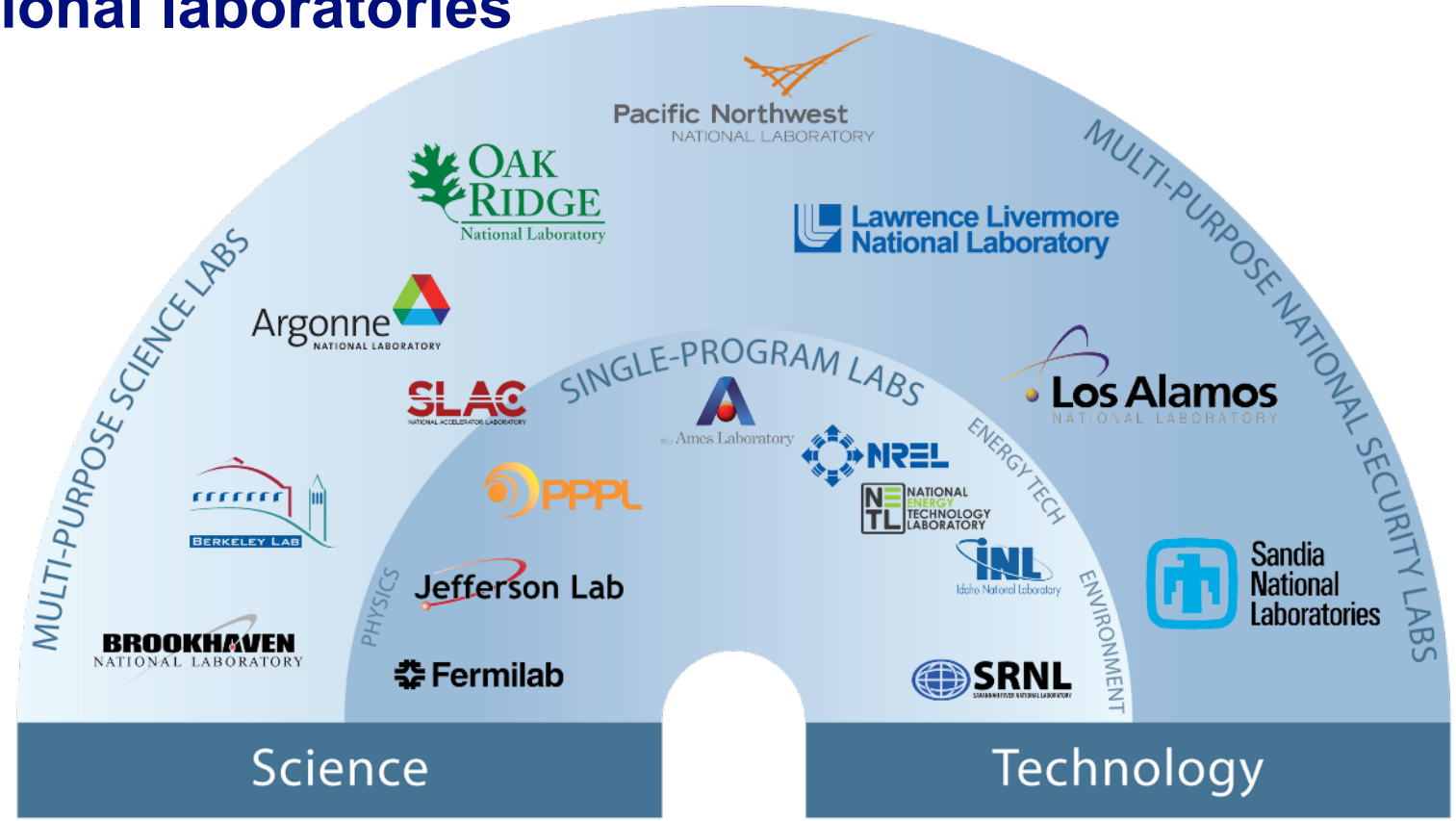
- A catalyst for new ideas, partnerships and deeper engagement *that*
- Enables multiple large scale, externally funded research initiatives that cross-cut the campuses and Labs *and*
- Deepens student and faculty engagement between Labs and campuses that support the UC National Labs in their efforts to build the diverse workforce of the future *and*
- Provides and shares enabling tools to foster initial partnerships that advance the growth and vitality of the research collaborations.

Los Alamos delivers national security solutions

- **We are dedicated to addressing complex national security issues and the world's most difficult challenges**
  - By applying multidisciplinary science, technology & engineering capabilities
  - In unique experimental, computational, and nuclear facilities
  - With an agile, responsive, and innovative workforce
  - And by partnering with peer institutions for mission success

LANL Statistics
$4B budget
40 square miles, 47 technical areas
1,280 bldgs., 9M sq ft,
11 nuclear facilities
13,000 workers on site
9,900 career employees
1,600 students, 490 postdocs
Employee average age: 43
65% male; 35% female 45% minorities
40.4% of employees are native New Mexicans

Los Alamos is one of 17 Department of Energy national laboratories



LANL is a key part of the U.S. nuclear security enterprise

National laboratories and test sites

Los Alamos National Laboratory*

Lawrence Livermore National Laboratory

Nevada National Security Site

Sandia National Laboratories*

Production complexes

Kansas City National Security Campus

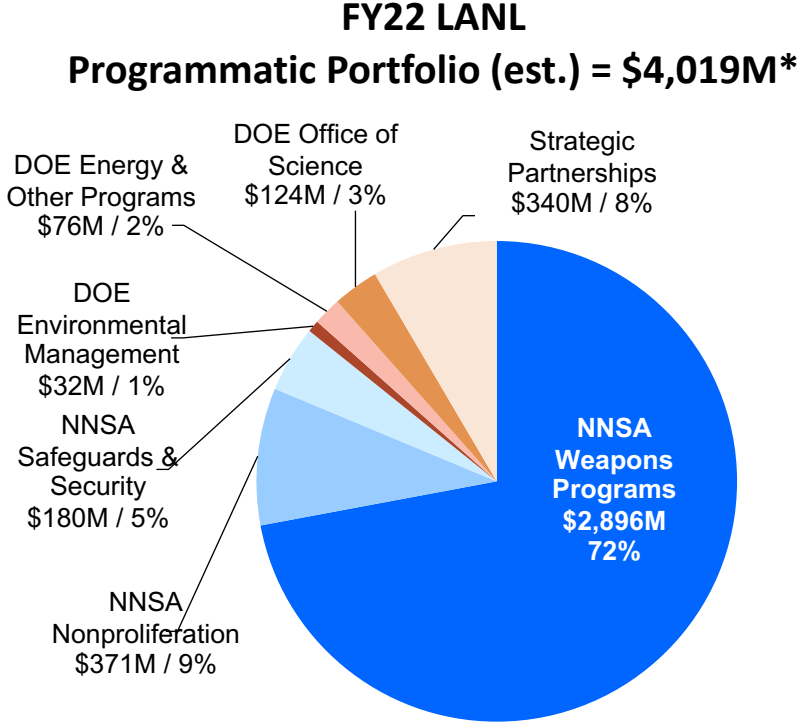
Pantex Plant

Savannah River Site

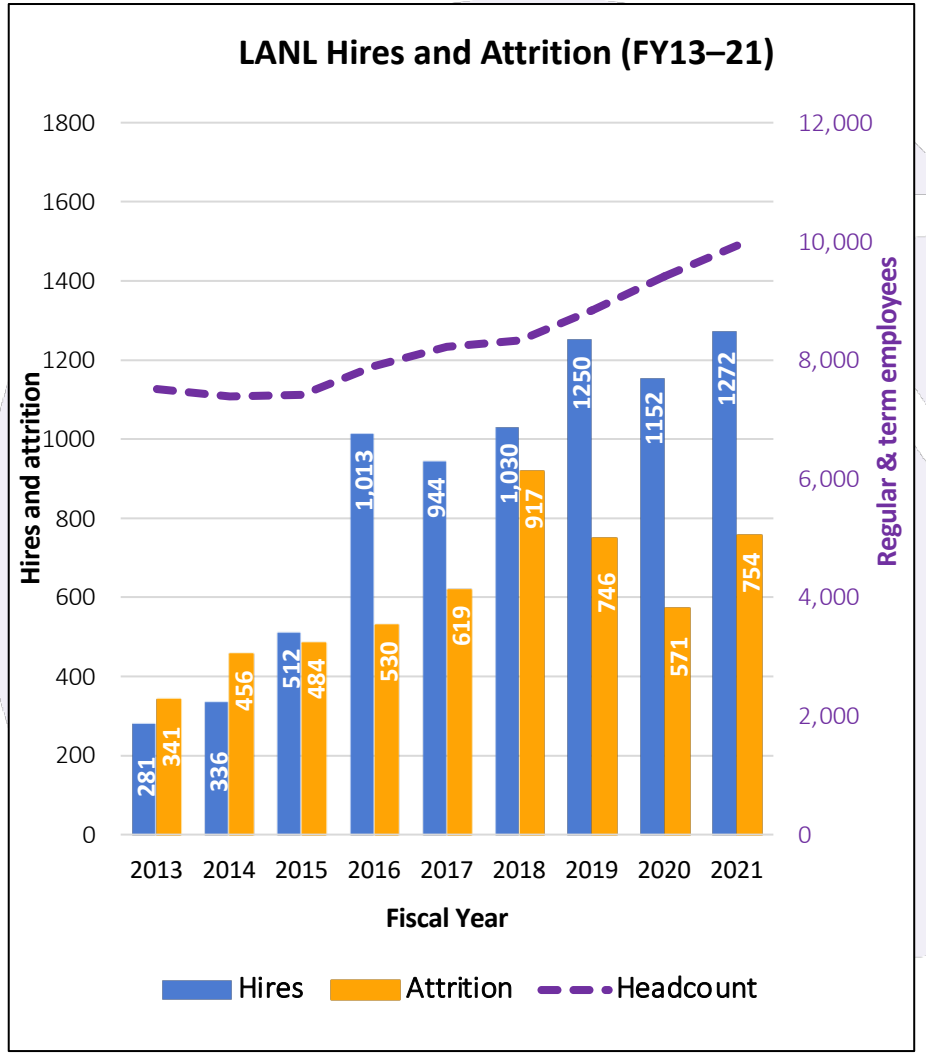
Y-12 National Security Complex

*Also production facilities

Budget, employee numbers continue to grow



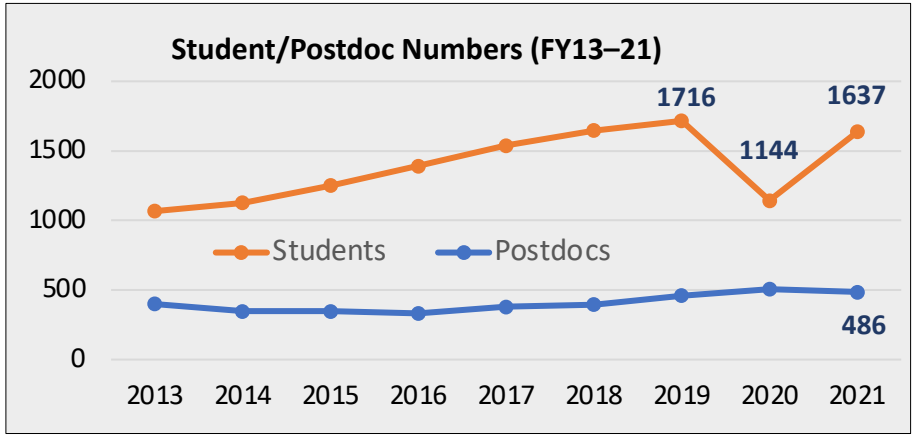
**$276M more than FY21*



Los Alamos NATIONAL LABORATORY

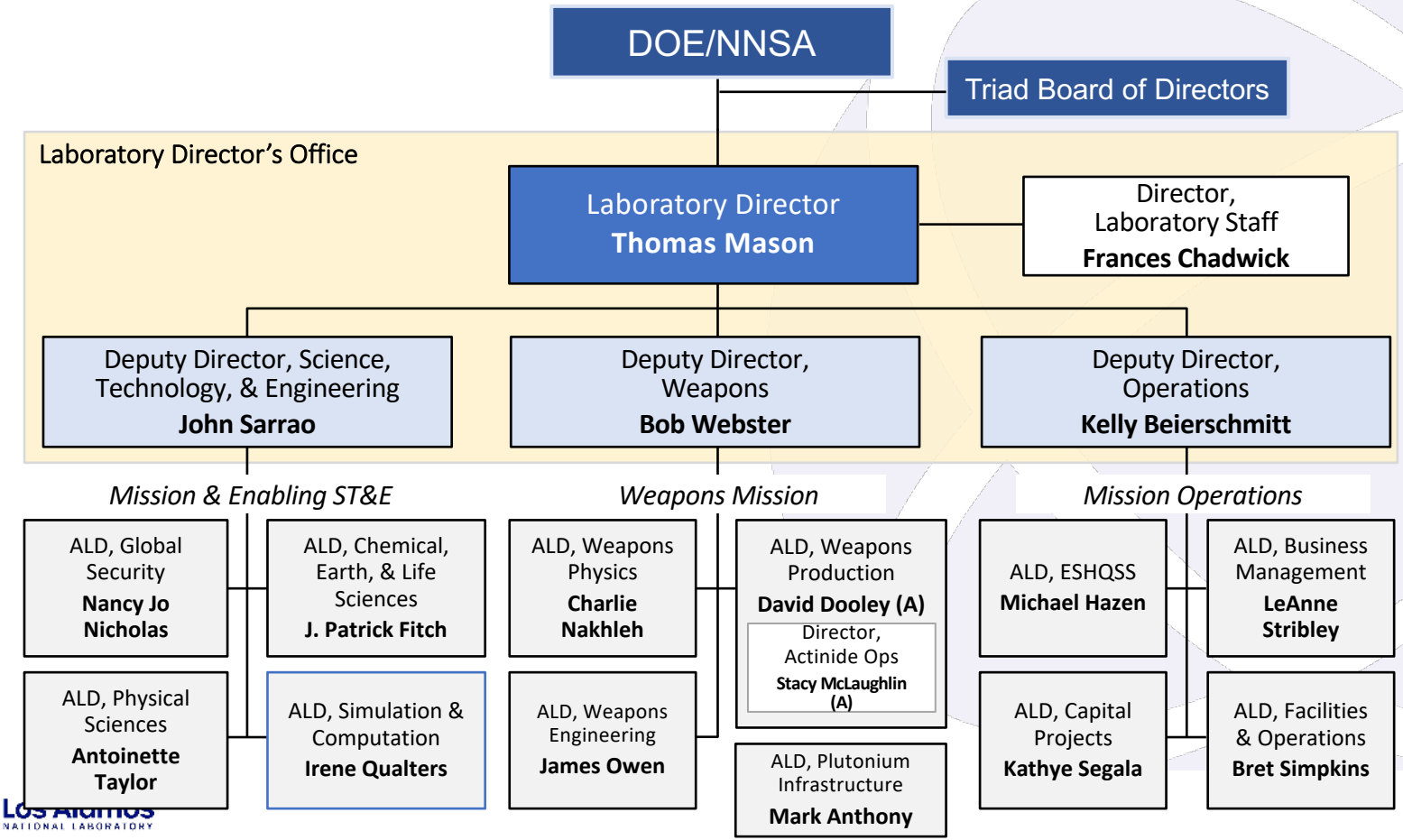
Focus on people

- Hybrid student program successfully realized in 2021
- Summer schools are a unique pipeline to recruit students in key technical areas
- Rigorous postdoc conversion process leads to talented early career staff with key mission skills
- Student programs, pipeline initiatives boost diversity in student pipeline
  - See e.g., women.lanl.jobs

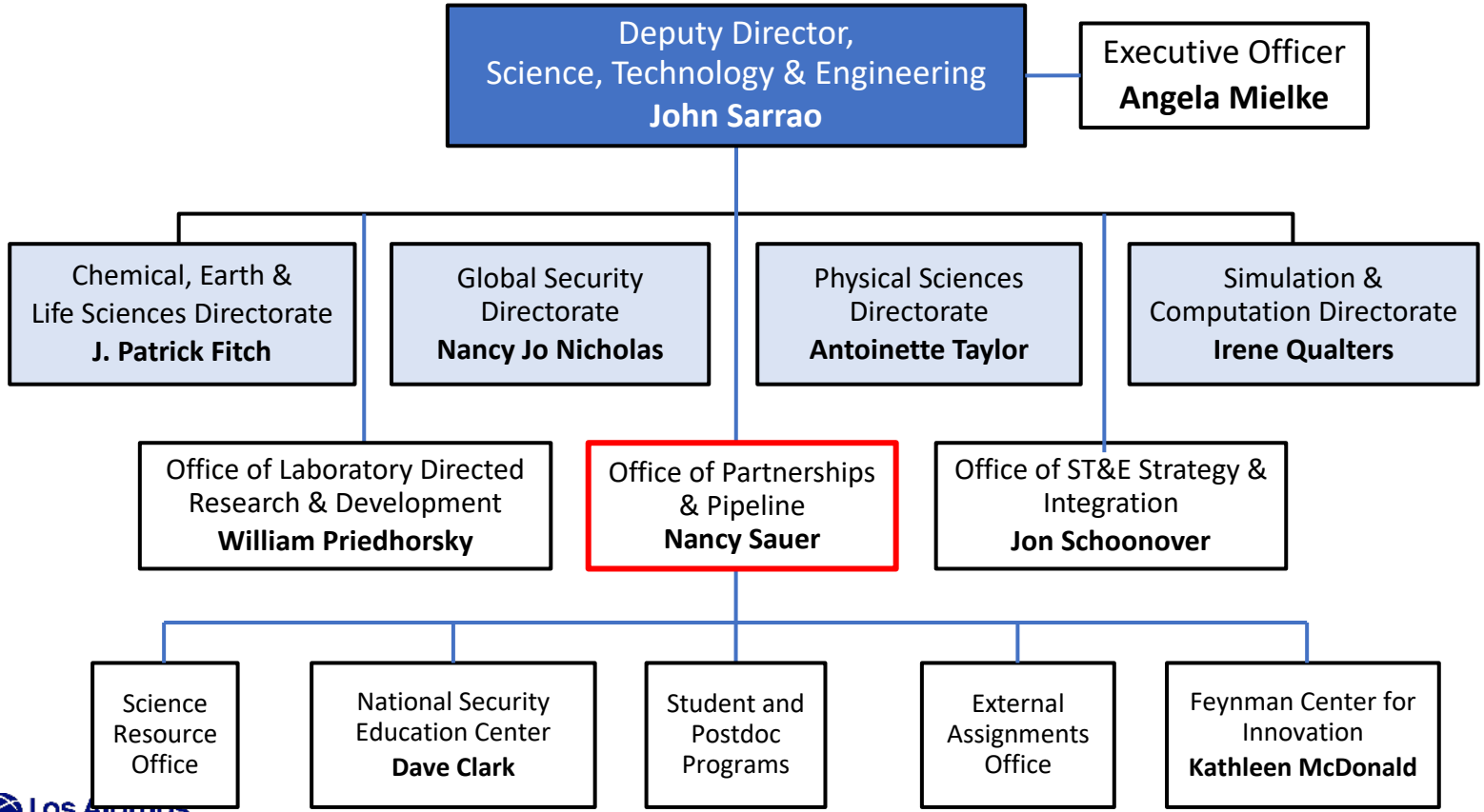


Postdoc Conversions compared to Non-management PhD Technical Staff Hires (FY16-21)						
	FY16	FY17	FY18	FY19	FY20	FY21 thru Q3
Postdoc Conversions to Scientist and R &D Engineer	79	67	79	85	73	55
Total PhD Non-Management Scientist and R&D Engineer, Levels 1-3 plus PhD GRA & Postdoc Conversions	114	102	110	127	113	78
% of Postdoc Conversions to Total PhD Staff Hires	69%	66%	72%	67%	65%	71%

LANL Organization structure



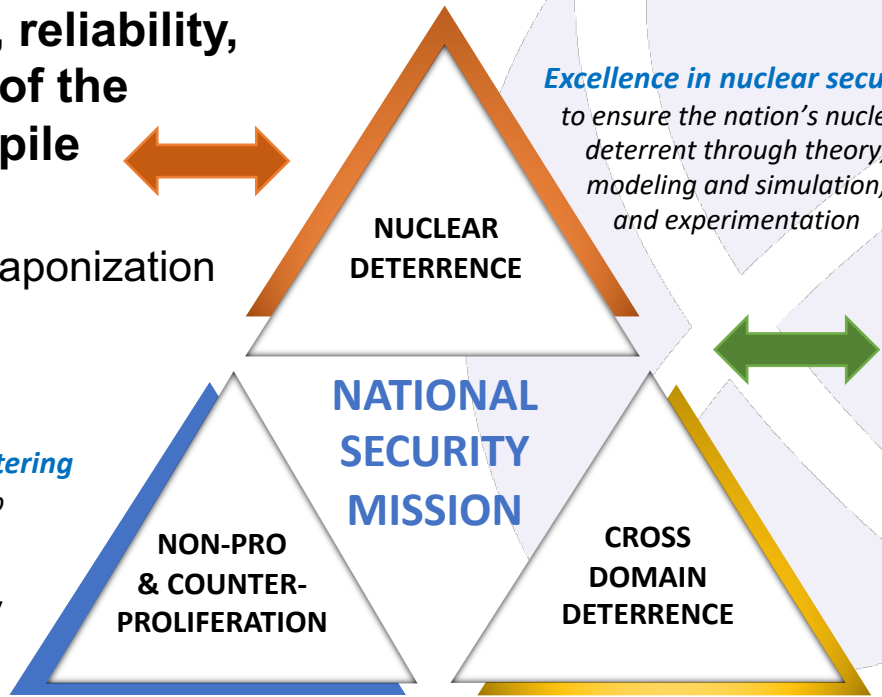
DDSTE stewards institutional capabilities for the Laboratory



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

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

- Physics & Design
- Engineering & Weaponization
- 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*

Modern stockpile stewardship differs radically from last-century stewardship

- **LANL is the design laboratory for 4 of the 7 weapons systems in the nation's on-alert deterrent**
- Stewardship today involves testing facilities, surveillance, simulation and supercomputing, and nuclear material facilities
- Multidisciplinary science and engineering underpin all LANL programs, as experiments enrich our nation's confidence in the stockpile
- LANL collaborates exclusively with DOE labs and industry to perform R&D for federal sponsors

U.S. testing site craters and the Trinity supercomputer

LANL is modernizing three weapon systems and beginning development of the first new system since the Cold War

- The **W76-1 and W76-2 Life Extension Programs** are nearly complete, refreshing the backbone of the US deterrent
- The **W88 ALT 370, high explosive refresh, and ALT 940** will modernize the balance of the seaborne deterrent
- The **B61-12 LEP** will consolidate four B61 weapons into a modernized, sustainable system with enhanced accuracy
- The **new W93 program** will deliver the next-generation of sea-launched warhead to meet evolving military needs

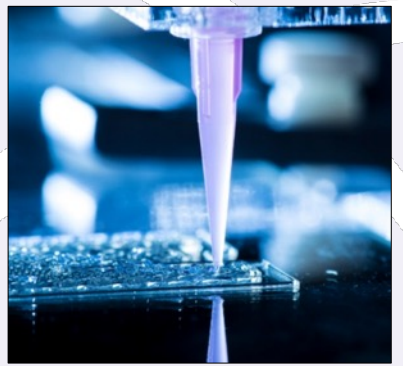
Significant experimental effort

Significant R&D effort

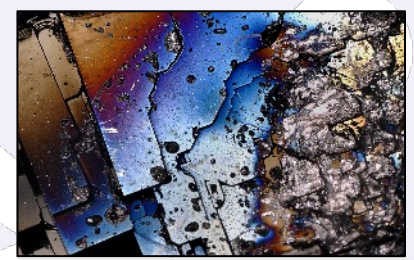
LANL is also responsible for the production of essential weapon components

- LANL serves as the **production agency** for:
  - Detonators, Power supplies, Pits
- We serve as **technical reachback** for
  - High explosives, Cases, Gas systems
- Our **enhanced pit production mission** (from boutique R&D capability to sustained 30 pits per year) is a major focus of the entire Laboratory
- LANL is the **NNSA Center of Excellence for Plutonium**:
  - NASA radiothermal generator production
  - Plutonium science and metallurgy
  - Americium production for the Office of Science

Casting



Additive Manufacturing

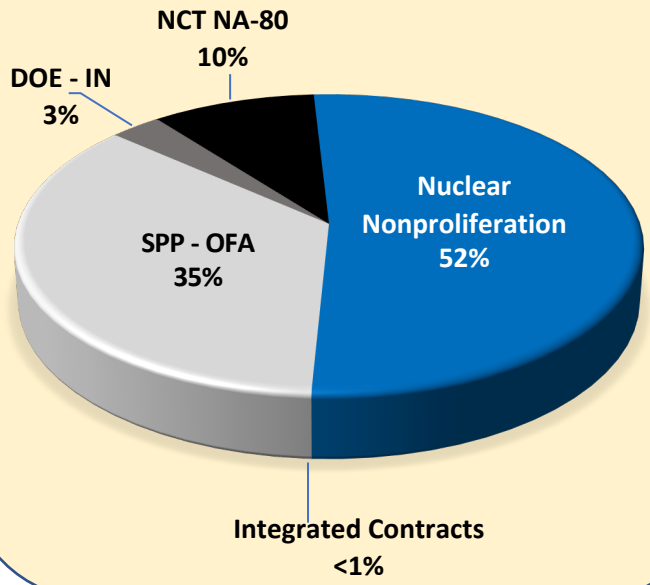


Actinide Science

We execute significant scope beyond NNSA-weapons that contributes to national security and enhances NW capabilities

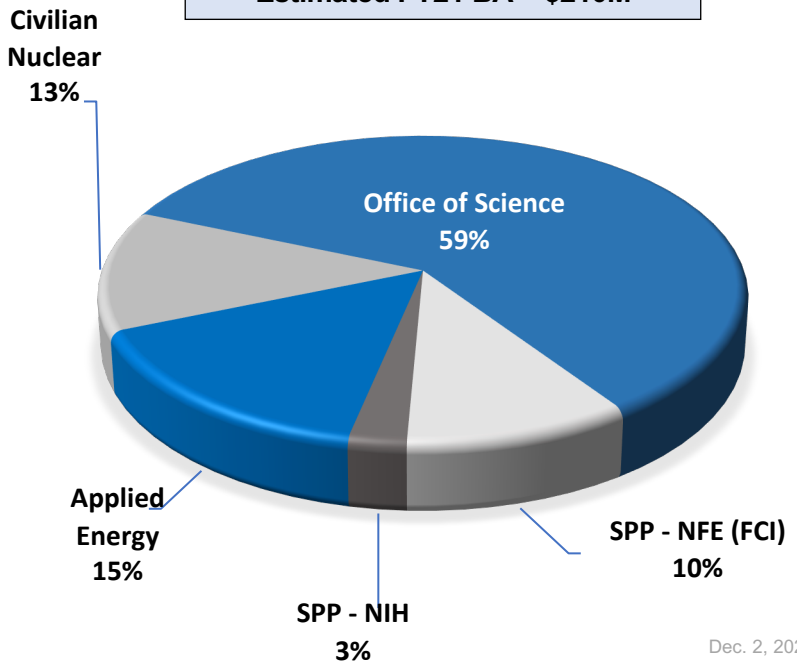
GLOBAL SECURITY PROGRAMS

Estimated FY21 BA = $585M



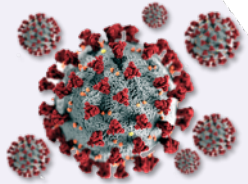
SCIENCE & ENERGY PROGRAMS

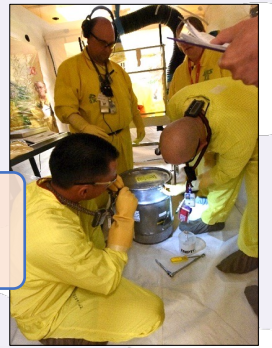
Estimated FY21 BA = $210M



Our Global Security portfolio is responsive to national needs and answers “Why LANL?”

- “It takes a weapons lab to find a weapons lab”
- The Laboratory as a testbed: experimentally validated intelligence



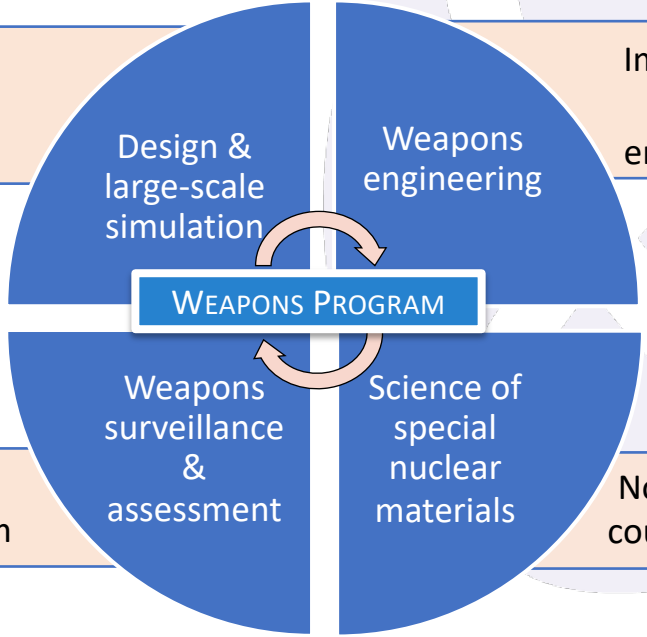


Foreign weapons & program assessments

Improvised nuclear devices & nuclear emergency response

Nuclear counterterrorism

Nonproliferation & counterproliferation



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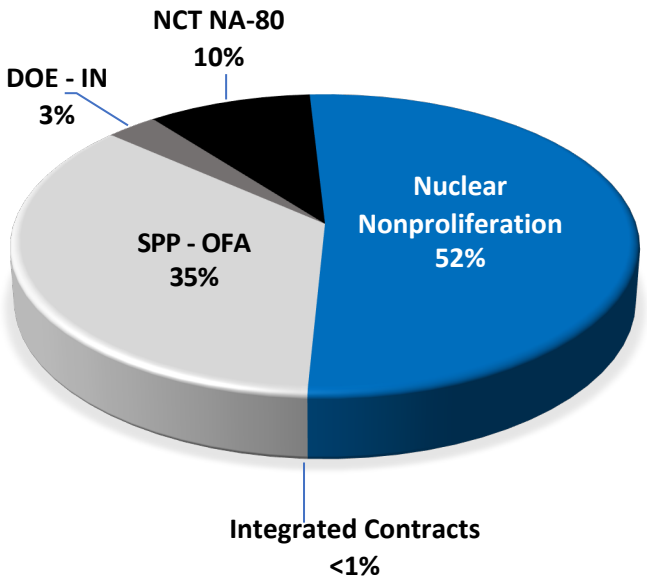

SCIENCE & ENERGY PROGRAMS

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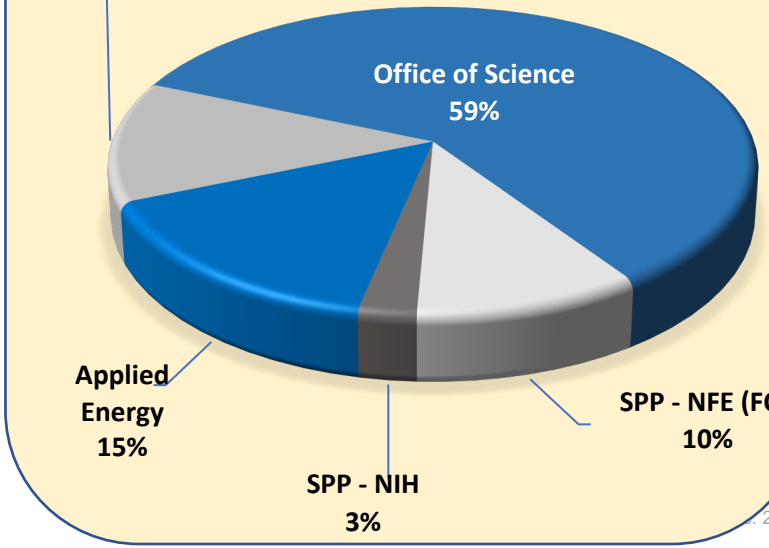
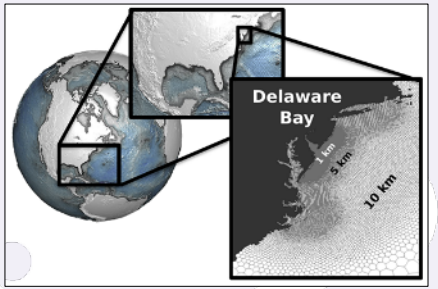
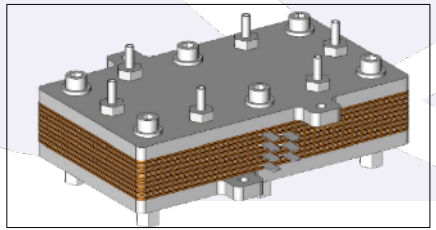


Los Alamos has a history of research in climate science, clean energy, and decarbonization

- Interface of energy, climate, environment, human health, and national security
  - Energy security
  - Climate resilience
- From basic to applied
- From planet to region to networks to new sustainable materials & devices



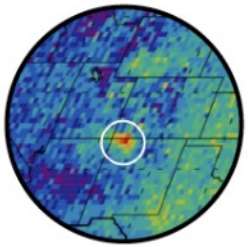


E3SM

Los Alamos translational work in climate science has civilian and national security foci

- Predictions for coastal resiliency
- Emergency infrastructure response to extreme weather
- Detection and attribution of climate manipulation
- Permafrost vulnerability, sea level rise
- Impacts of climate, extreme weather, fire, regional forest mortality on water resources
- Disease forecasting using satellite imagery, clinical surveillance data, climatological data, demographic data, and google search queries


Coastal Resilience


Geoengineering


The New Arctic


Nuclear Env.


Regional Stability

Nuclear energy efforts span Office of Nuclear Energy and beyond…

- Current strong support for the next generation of reactors, including robust microreactors, compact space systems, small modular, and advanced molten salt, gas-cooled, etc.
- Partnership is multi-agency (not just civilian)
  - DoD, NASA, industry, DOE joint interagency agreements, with NNSA engagement
- Growth of nuclear energy is true under a range of futures:



NASA

INL Idaho National Laboratory

NNSA National Nuclear Security Administration

DARPA DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Our goal is to maintain LANL as a key partner in synergistic R&D: reactor design and safeguards, nuclear data and modeling/simulation, advanced ceramic fuels, and sub-scale proof-of-principle nuclear experiments.

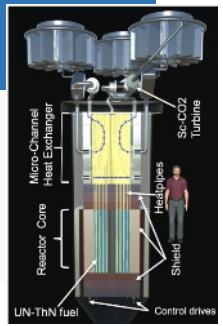
LANL contributes broadly to DOE's energy portfolio

Energy Efficiency and Renewable Energy (EERE)

- Bioenergy Technologies
- Hydrogen & Fuel Cells Technologies
- Vehicle Technologies
- Geothermal Technologies
- Solar Energy Technologies
- Wind Energy Technologies
- Advanced Manufacturing

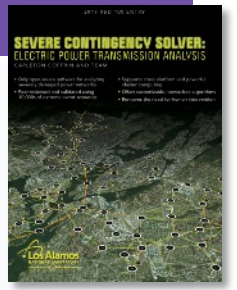
Advanced Research Projects Agency-Energy (ARPA-E)

- Transformational energy projects



Office of Electricity (OE)

- Advanced Grid Research & Development
- Energy Storage
- Microgrid Research & Development
- Grid Modernization Laboratory Consortium



Cybersecurity, Energy Security, and Emergency Response (CESER)

- Cybersecurity for Energy Delivery Systems
- Infrastructure Security & Energy Restoration

Office of Fossil Energy (FE)

- Carbon Storage
- Carbon Capture
- Unconventional Technologies
- Advanced Energy Systems
- Cross-cutting Research (rare-earth elements; materials in extreme conditions)

We leverage our scientific and technical capabilities to contribute to multi-institutional energy collaborations

National Risk Assessment Partnership (NRAP)

Carbon Capture Simulation for Industry Impact (CCSI²)

Bio-Optimized Technologies to keep Thermoplastics out of Landfills and the Environment (BOTTLE)

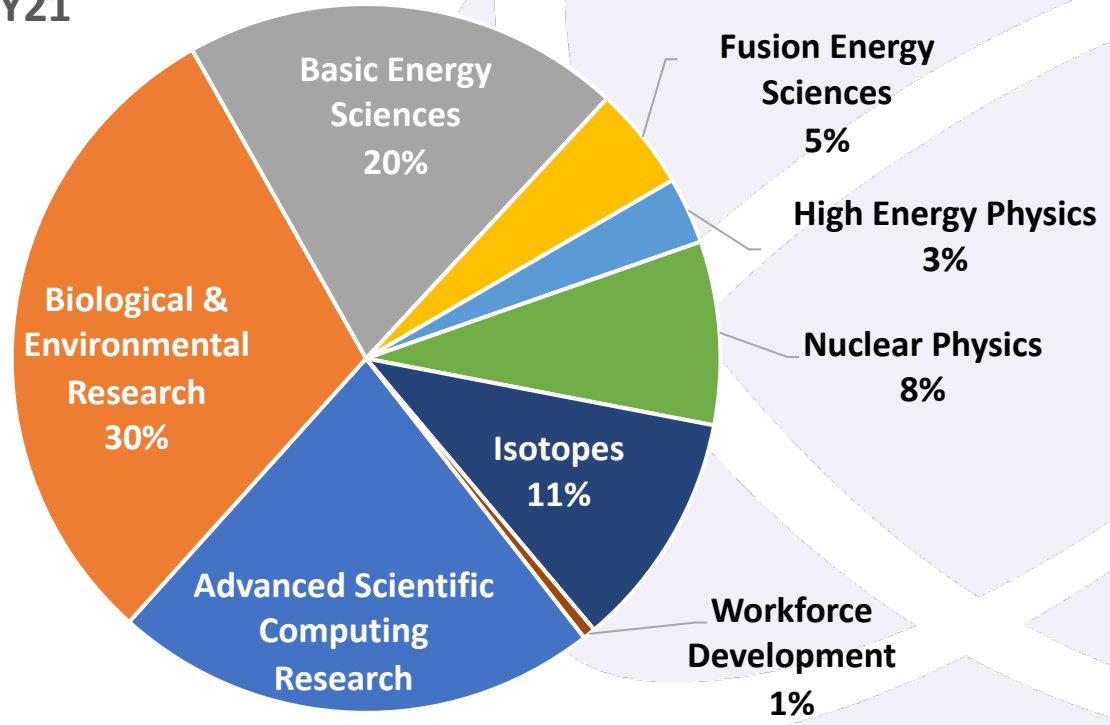
Feedstock Conversion Interface Consortium (fcic)

Million Mile Fuel Cell Truck (M2FCT)

Grid Modernization Laboratory Consortium (GMLC)

LANL has a >$100M/year Office of Science portfolio spanning the breadth of SC

Office of Science FY21
$132.1M BA



Simultaneous excellence:
Balance between operations and mission

Design, produce, and certify current and future nuclear weapons and reduce global nuclear threats

Deliver scientific discovery and technical breakthroughs that support DOE & NNSA missions

Execute sustained operations that are reliable and responsive to mission needs

Sustain and enhance LANL's partnership with the community across Northern New Mexico

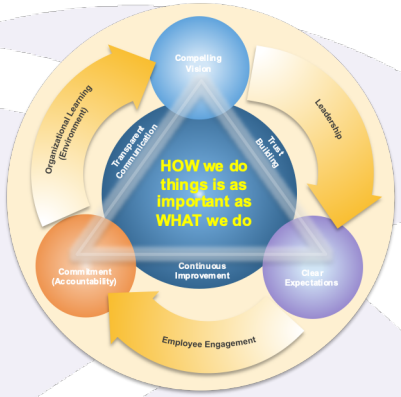
***How* we do our work is as important as *what* we do**

HOW we do our work is as important as WHAT we do

- **Safety Culture**
  - 8 Safe Conduct of Research (SCoR) principles
- **Commitment to diversity, inclusion, and belonging**

  "Diversity is a fact, inclusion is a behavior, but belonging is the emotional outcome that people want in their organization."

  – Christianne Garofalo, Heidrick & Struggles
- **Expectations of Managers and Mentors defined to provide meaningful and safe student experiences**
  - Managers shall actively manage student count, consistent with space and mentor capacity
  - Managers shall have regular, meaningful interactions with each student
  - Mentors shall create an opportunity for each student to present his/her work and outcomes in some broader forum



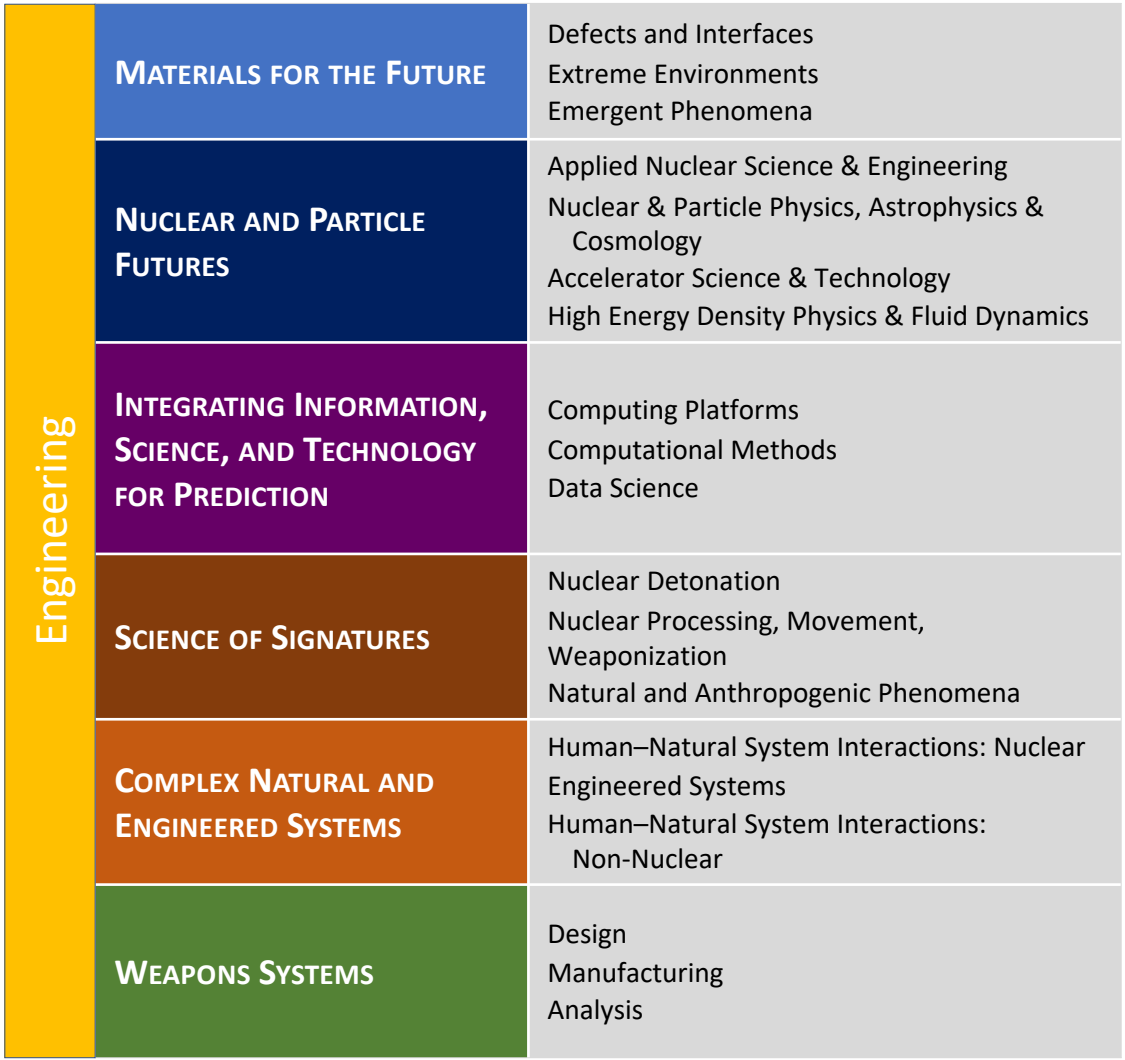
1. Everyone is personally responsible for ensuring safe operations.
2. Leaders value the safety legacy they create in their discipline.
3. Staff raise safety concerns because trust permeates the organization.
4. Cutting-edge science requires cutting-edge safety.
5. A questioning attitude is cultivated.
6. Learning never stops.
7. Hazards are identified and evaluated for every task, every time.
8. A healthy respect is maintained for what can go wrong.

FY21 Lab Agenda

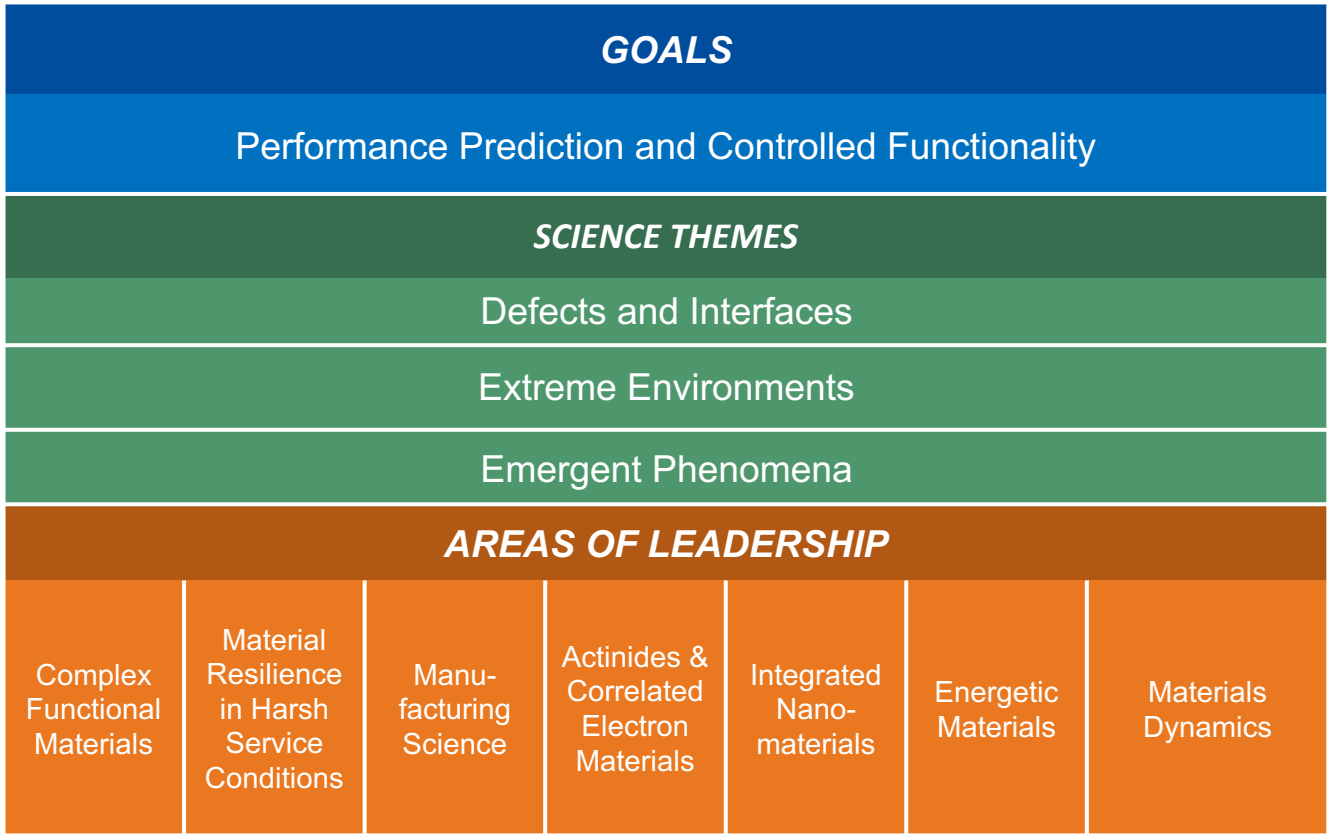
SIMULTANEOUS EXCELLENCE	1.0 NUCLEAR SECURITY	2.0 MISSION-FOCUSED SCIENCE, TECHNOLOGY & ENGINEERING	3.0 MISSION OPERATIONS	4.0 COMMUNITY RELATIONS
Strategic Objective (10–20 years)	Excellence in Nuclear Security	Excellence in Mission-Focused Science, Technology & Engineering	Excellence in Mission Operations	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

Long-term ST&E stewardship is based on Capability Pillars

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



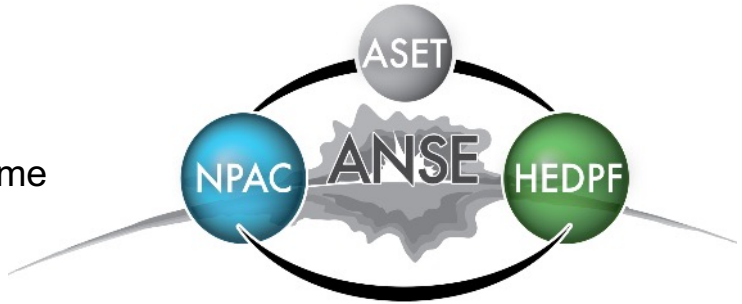
Materials for the Future Strategy links leadership areas through science themes to achieve overarching goals



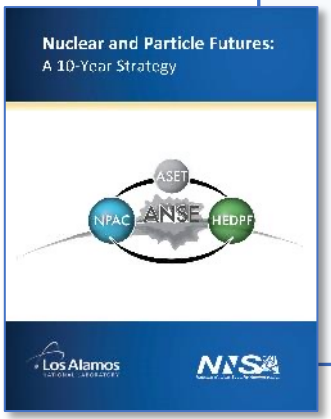
NPF encompasses a broad range of capabilities necessary for LANL to complete its national security science mission

NPF Pillar is composed of four focus areas:

- **Nuclear, Particle, Astrophysics, and Cosmology (NPAC)**
  - The origin and evolution of the universe and the most extreme environments in the universe
- **Applied Nuclear Science and Engineering (ANSE)**
  - The application of nuclear science to national security
- **High-Energy-Density Plasmas and Fluids (HEDPF)**
  - The hydrodynamics, thermodynamics, and kinetic behavior of fluids and plasmas
- **Accelerator Science, Engineering & Technology (ASET)**
  - A foundational capability needed to meet our national security mission with connections to basic science activities as well.



The primary goals of the NPF Pillar are to steward, develop, and integrate our foundational capabilities in particle physics, accelerators, applied and fundamental nuclear physics, fluid dynamics, plasma physics, astrophysics, and cosmology to solve the nation's most difficult challenges.



The 10-year goals for the IS&T Pillar are being defined in a strategic planning process

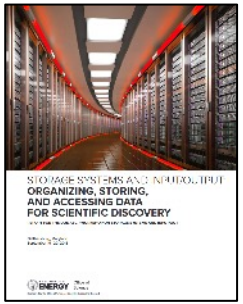
- **Transform Simulation**
  - Develop innovative, multi-physics, multi-scale methods and solutions that increase simulation fidelity, are efficient on modern architectures, and are suitable to applied problems of national interest
- **Data-driven Scientific Discovery**
  - Engineer a full toolchain of artificial intelligence, data management, streaming, interactive, and large-scale data analysis mechanisms targeted to routinely extracting enhanced knowledge and achieving the 10-year goals of other LANL pillar goals
- **Information Integrity**
  - Develop methods to assure the integrity of data, information, and analytical tools including artificial intelligence to ensure the correctness of scientific inferences, discoveries, and decisions made from data
- **Quantum Computing**
  - Execute applications of mission relevance on large, fault-tolerant, modular quantum computers; Be recognized as a major influence in quantum algorithm development across the entire software stack for both fault-tolerant quantum computers and NISQ devices

We believe "physics-informed" machine learning is a differentiator

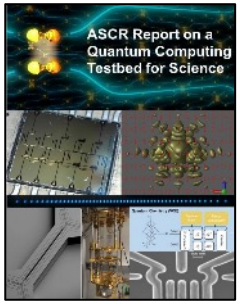
In Situ Data Management

Scientific Machine Learning

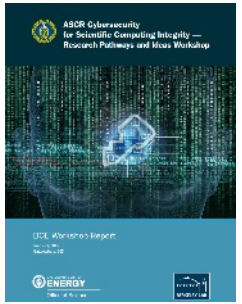
Data and Models



Storage Systems and I/O



Quantum Computing



Scientific Computing Integrity

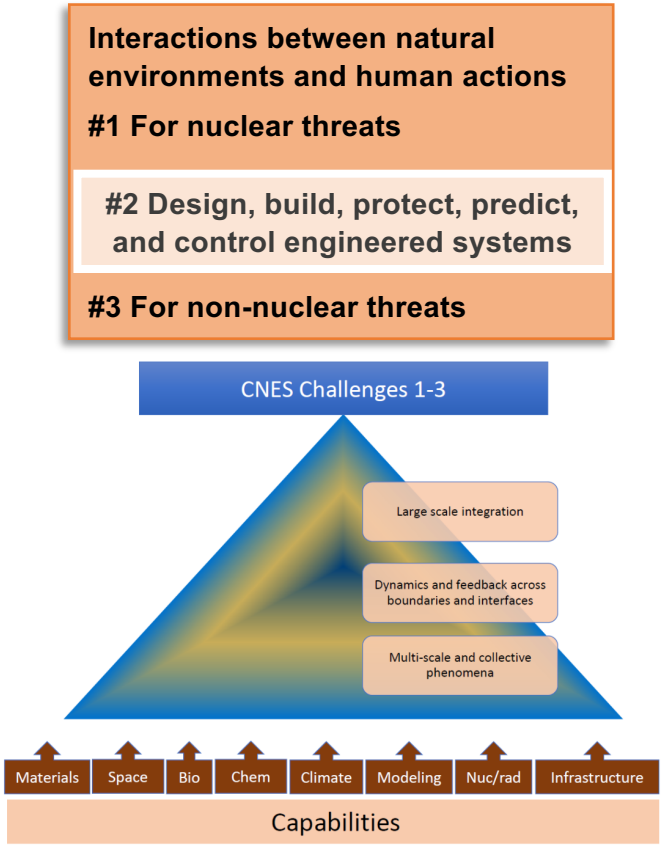
Science of Signatures (SoS) Pillar science themes address challenges

- **Discover signatures that (in complex environments) can**
  - Be extracted to detect and characterize chemical, biological, radiological, nuclear, and explosives threats
- **Revolutionize measurements through**
  - New technologies, methodologies, or strategies that enable transformational advance in performance of measurement systems and derived information
  - Systems that exploit novel data-to-knowledge approaches
  - Measure new phenomena (signatures)
- **Deploy to unusual or extreme field environments through**
  - Engineering and applied science for prototyping, demonstration, field deployment, and technology transfer to public, private, and government sectors
  - Transformational resource reduction (size, weight, power, communications) while maintaining or even increasing system performance

Address challenges in national security, energy/climate, and health

CNES is organized into three strategic challenges

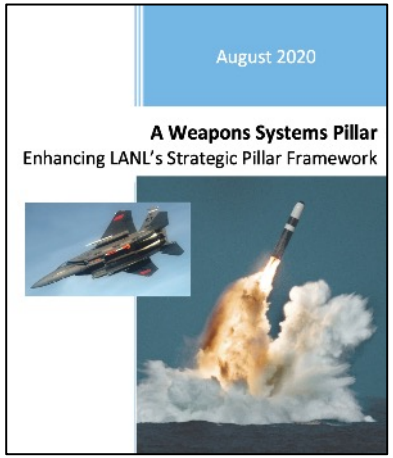
- **Challenge #1 - Explain the complex interactions and resulting impacts between natural environments and human actions from nuclear threats**
  - **10-year goal:** Understand and predict the effects of nuclear events on natural environments (Earth's core to space)
- **Challenge #2 - Design, build, protect, predict and control engineered systems**
  - **10-year goal:** Develop sufficient predictive ability to enable improved resilience in design of engineered systems or, where applicable, to develop the means to maintain positive control even outside of design lifetime or specification
- **Challenge #3 - Explain the complex interactions and resulting impacts between natural environments and human actions involving non-nuclear threats**
  - **10-year goal:** Establish science-based models and systems of human-environment interactions representing natural threats and anthropogenic non-nuclear threats that inform national policy and decision makers



Weapons Systems Pillar focuses on integrated, systems-level, weapons physics, engineering, and manufacturing

The most recent Nuclear Posture Review foreshadows a transformation

LEP era	Post-LEP era
Optimized for Yield/weight	Optimize for certifiable and manufacturable
Aging to many decades not considered in original design (LEPs needed)	Sustain an aging stockpile
Slow (since 1992)	Responsive - must become agile, quick
Post-1992 stewardship experimental/ computing built; used with UGTs of original design, and “similitude”	Modern experiments, modeling, and simulation that increasingly account for weapons-relevant regimes
Focused on predictive capability & eliminating knobs	Enable modular design, qualification, certification & manufacture
MAD deterrent derived from 1980s stockpile	Resilient deterrent customized to 21st century evolving threat space



R&D Focus Areas:

- Design & system integration
- Production/Design for manufacture
- Systems analysis

LDRD, invested through the pillars, is an important mechanism to ensure capability health

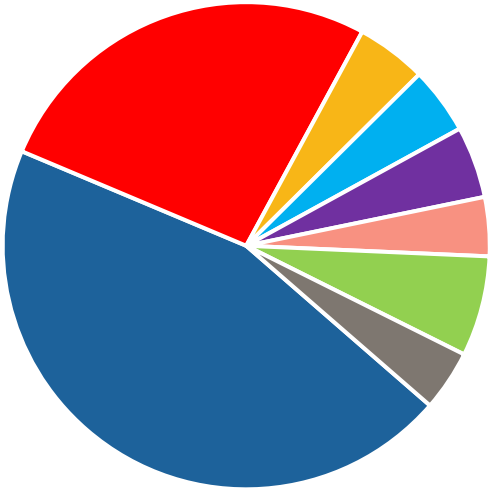
Exploratory Research
27%
Innovate at the frontiers of technical disciplines

Directed Research
45%
Create multidisciplinary solutions to complex problems defined by Lab strategy

Director's Initiatives
7%
Invest in the Lab Agenda with the rigor and creativity of LDRD

Reserve (unencumbered)
4%

Baseline LDRD Program
FY22 Budget: $180M



LDRD fosters mission agility, technical vitality and workforce development

Early Career Research
5%
Develop next-generation technical leaders

Postdoctoral R&D
4%
Attract and recruit top-quality talent into the Lab's pipeline

Mission Foundations
5%
Translate discovery into novel mission solutions

Centers Research
4%
Incubate emerging ideas and talent in areas defined by the Lab's Strategic Centers

Partnerships & Pipeline Office (PPO) was formed to enhance our internal coordination and external outreach

Pipeline

Partnerships

Pipeline Mechanisms:

- Student Programs: Education opportunities for high school, undergraduate, and graduate students
- Postdoctoral Programs: Postdocs contribute to research efforts, enhance our STE capabilities

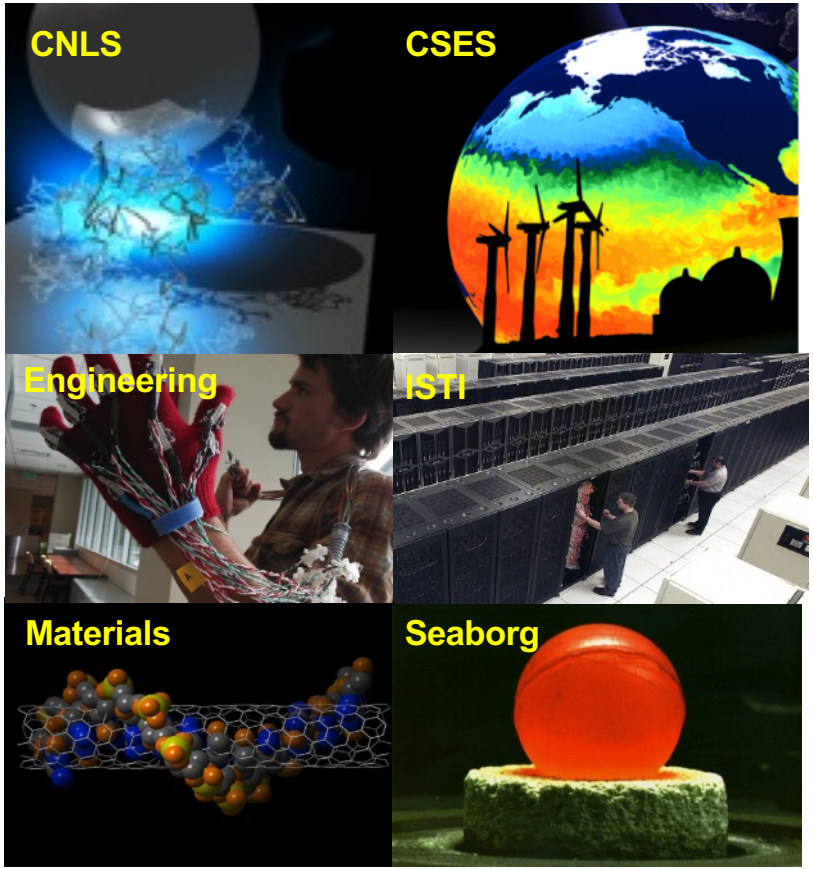
Partnership Opportunities:

- National Security Education Center Strategic Centers: Scientific centers of excellence with high international visibility that innovate strategic new science and education programs
- New Mexico Consortium Coordination: Creative mechanisms for collaboration with NM research universities through joint appointments and unique facilities
- Feynman Center for Innovation: From “tech transfer”’ to innovation asset stewardship with strategy driven through Innovation Asset Strategic Council

National Security Education Center Strategic Centers are a key window to the outside world

- **Center for Nonlinear Studies**
  - Interdisciplinary science of complex systems
- **Center for Space and Earth Science**
  - Astrophysical, space, earth, & climate sciences & their signatures
- **Engineering Institute**
  - UCSD collaboration in Structural health monitoring, cyberphysical systems
- **Information Science & Technology**
  - Education, collaboration, research in IS&T
- **Institute for Materials Science**
  - Advancement of interdisciplinary materials science
- **Seaborg Institute**
  - Actinide science & Plutonium Center of Excellence

Joint Center for Resilient National Security



PPO Contacts for follow-up

- **Undergraduate & Graduate Student Programs**

  Emily Robinson, errobinson@lanl.gov

- **Postdoc Programs**

  Mary Anne With, with@lanl.gov

- **National Security Education Center**

  Dave Clark, dlclark@lanl.gov

- **SoCal Hub (led by UC Irvine)**

  Pramod Khargonekar, Pramod.Khargonekar@uci.edu

- **If all else fails**, sarrao@lanl.gov (or right now)

Los Alamos delivers national security solutions

- **We are dedicated to addressing complex national security issues and the world's most difficult challenges**
  - By applying multidisciplinary science, technology & engineering capabilities
  - In unique experimental, computational, and nuclear facilities
  - With an agile, responsive, and innovative workforce
  - And by partnering with peer institutions for mission success