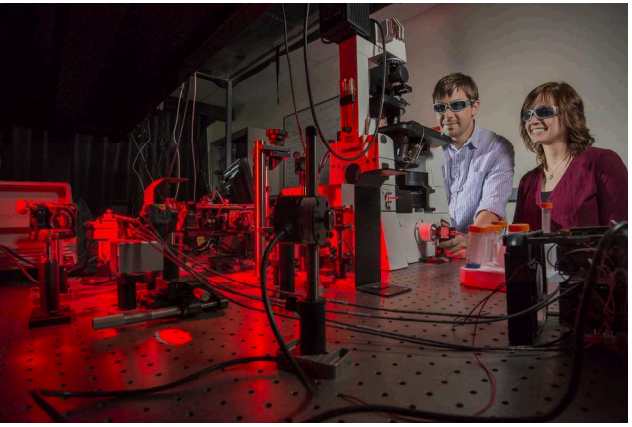
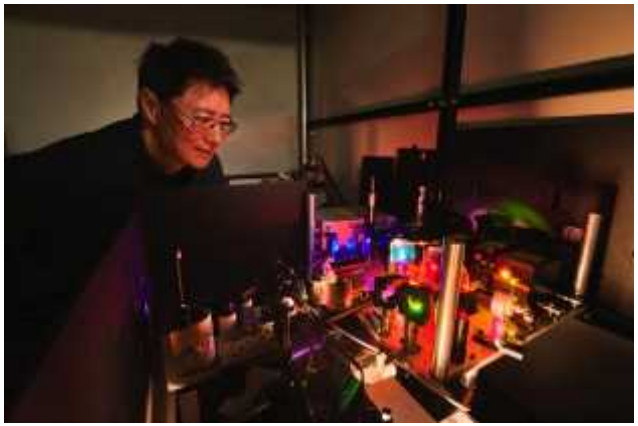
SAND2016-3922PE

Exceptional service in the national interest

Sandia National Laboratories





CTO Overview and Charge to the Board

Andy McIlroy
Director, Research Strategy & Partnerships
Deputy Chief Technology Officer

U.S. DEPARTMENT OF ENERGY | NNSA

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. SAND No. SAND2016-XXXX

Sandia's history

Exceptional service in the national interest

- **July 1945:** Los Alamos creates Z Division
- **November 1, 1949:** Sandia Laboratory established

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.

to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

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	Multiprogram laboratory	Missile defense work	Post–Cold War transition	Expanded national security role post 9/11	LEPs Cyber, Biosecurity Proliferation
	Vietnam conflict	Energy crisis	Cold War	Stockpile stewardship		Evolving national security challenges

Sandia's mission, research objective

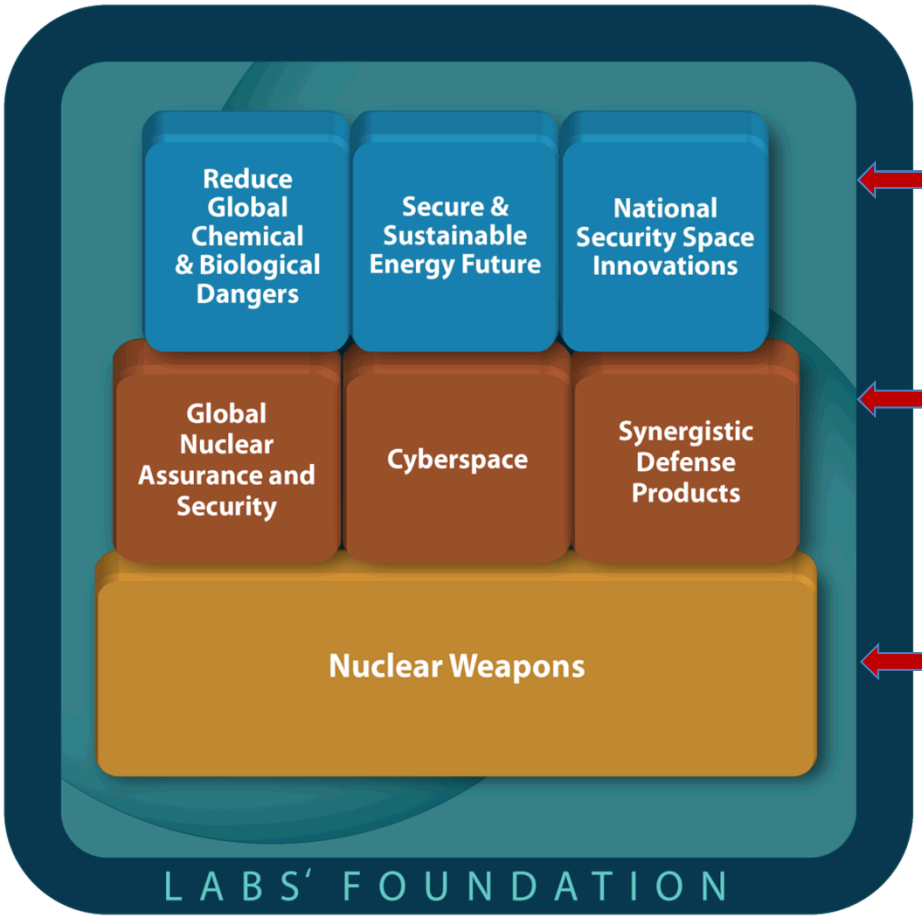
Our unique mission responsibilities in the nuclear weapons program create a foundation from which we leverage capabilities, enabling us to solve complex national security problems.

Research conducted at Sandia shall
enable mission delivery now and in the future and
advance the frontiers of science and engineering.





Sandia's mission areas



- Critical to national security
- Leverage, enhance, and advance Sandia's capabilities

- Strongly interdependent with nuclear weapons
- Essential to sustaining Sandia's ability to fulfill its NW core mission

- Nuclear weapons core mission is enabled by a strong scientific and engineering foundation

Sandia's foundation enables and connects the mission areas

People, facilities & tools, and research generate the capabilities that support our national security missions:

- High-reliability engineering
- Sensors and sensing systems
- Cyber technology
- Reverse engineering
- Pathfinders
- Modeling & simulation and experiment
- Natural and engineered materials
- Micro & nano electronics and systems
- Safety, risk, and vulnerability analysis

Sandia's research strategy

Providing direction for our research enterprise

Sandia National Laboratories

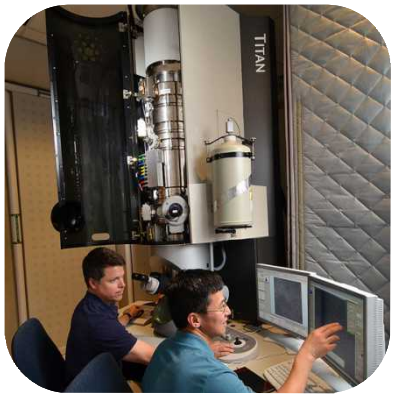
Strengthen our research portfolio

Research Foundation strategies and aligned LDRD investments sustain and strengthen the ST&E base

Address integrating Research Challenges

Research Challenges are "moon shot" research activities intended to drive integration of research and mission

Improve the research environment



Research environment improvements facilitate strategy execution and increase attractiveness of the Lab

Research Foundations

Enduring discipline-based competencies essential to our mission

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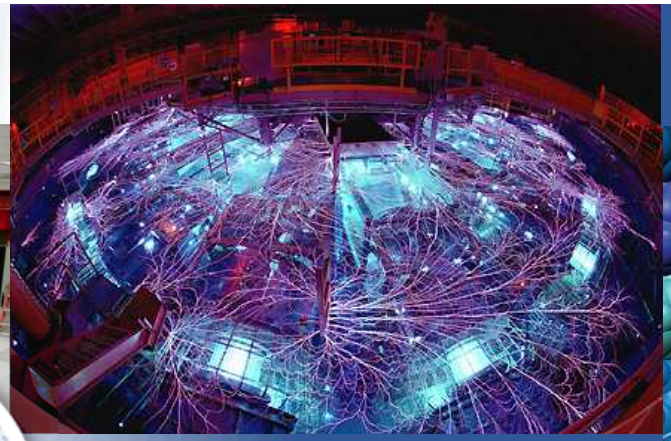
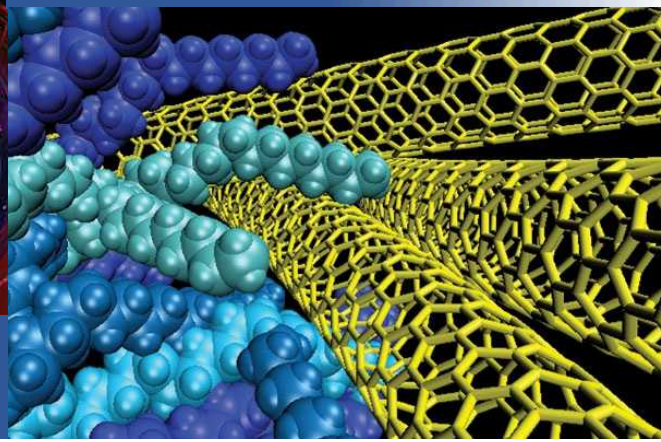
Computing & Information Sciences

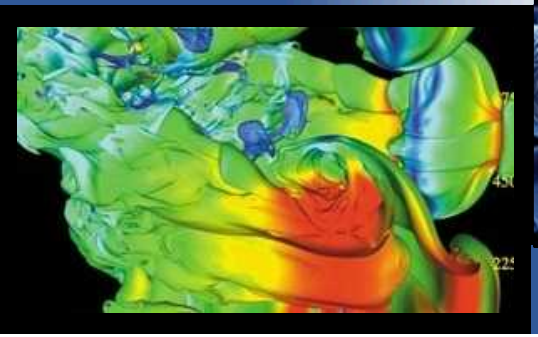


Radiation Effects & High Energy Density Science

Materials Sciences

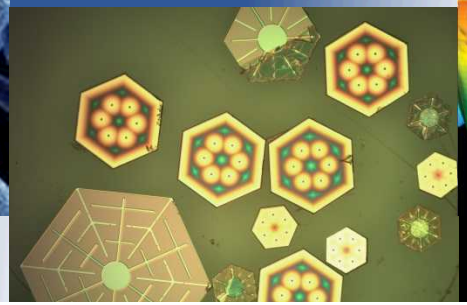


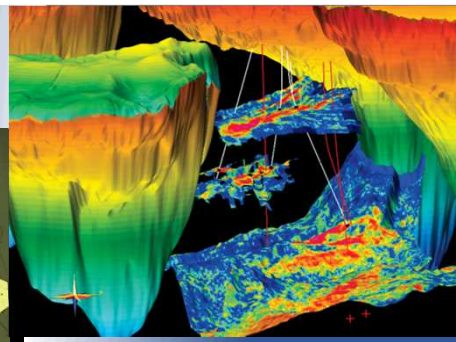
Engineering Sciences



Bioscience

Nanodevices & Microsystems



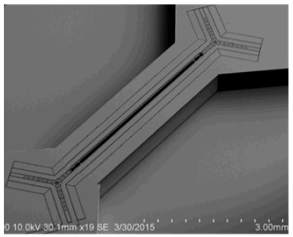


Geoscience

Sandia's Research Challenges

Multidisciplinary research campaigns that complement Research Foundations

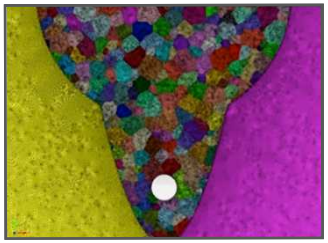
Power on Demand



Science & Engineering of Quantum Information Systems

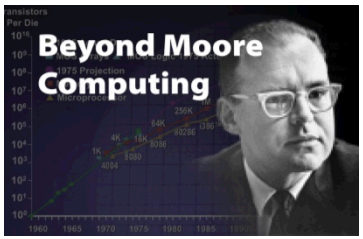
Trusted Systems & Communication

Detection at the Limit

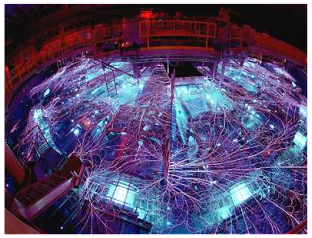


Engineering of Materials Reliability

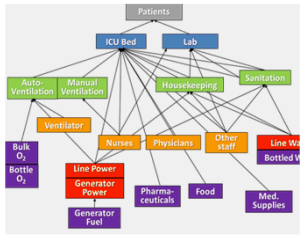
Data Science



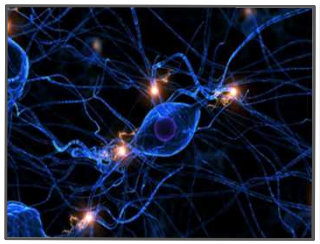
Beyond Moore Computing



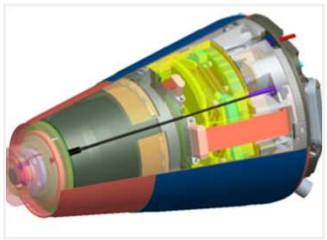
Pulsed Power Opportunities for Weapons & Effects Research



Resiliency in Complex Systems



Engineering Abiotic-Biotic Living Systems



Revolutionary Approaches to the Stockpile

Engage expertise from fundamental science to technology application

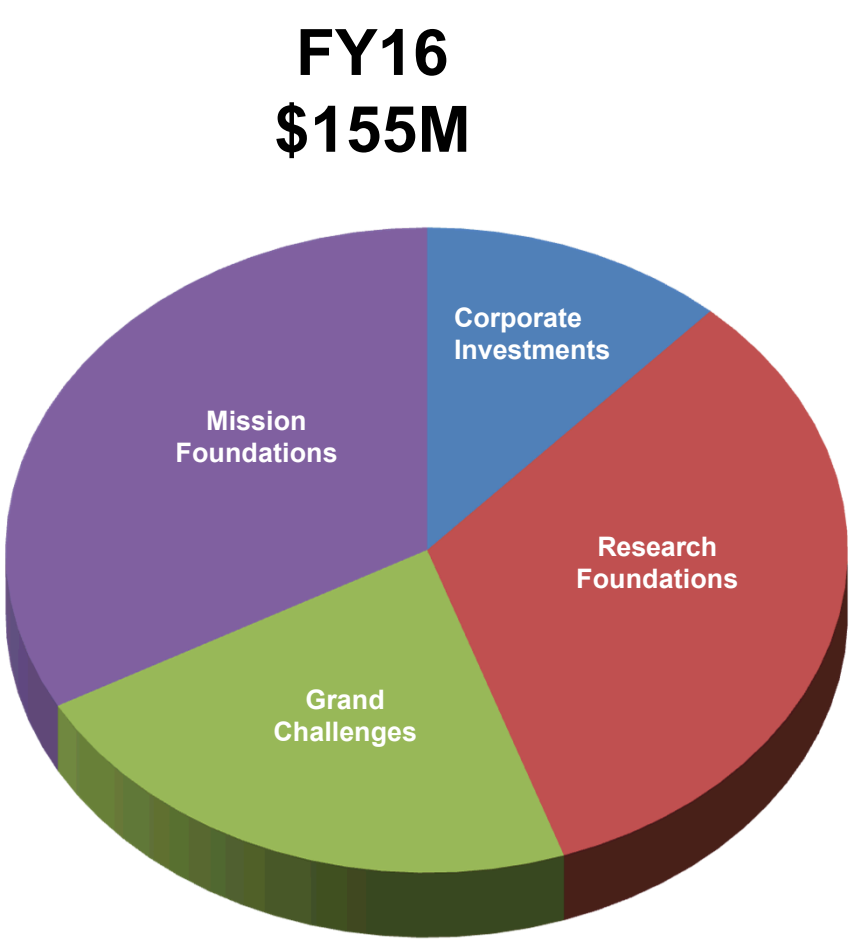
Pursue decade-scale "moon shot" goals guided by roadmaps

Create transformational capabilities that address mission-critical problems

Research Quality Standards

- Sandia's *Research Quality Standards* will enhance our leadership in research and innovation while preventing the undesired consequences of research defects
- Fifty case studies cover all phases of research to
  - Help research scientists avoid common problems that could harm their reputation and career
  - Help mentor and advise new researchers
  - Help assure our customers that our research is of the highest integrity

Laboratory Directed Research and Development



- **Research Foundations** – Anticipate future research needs and capabilities through exploratory research critical to all Mission Areas.
- **Mission Foundations** – Strategic R&D to support NNSA, DOE, and Strategic Partnership Projects missions and their ST&E needs.
- **Corporate Investments**
  - **Strategic Partnerships** – Leverage external resources to solve mutual challenges.
  - **Exploratory Express** – Enable embryonic research ideas with high potential.
  - **Reserves and Program Management** – Support emerging research opportunities.

Enduring goals support current program philosophy

Research Foundations

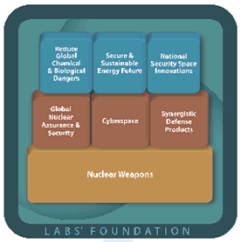
Mission Foundations

Corporate Investments

Grand Challenges

Strategy drives program execution

LABORATORY-DIRECTED
IA Calls incorporate strategic guidance from MAs and RCs.



CALL FOR IDEAS

~700 IDEAS

EMPLOYEE-SUGGESTED
Staff generate creative, high-risk, high-value ideas.

IAs consider:
programmatic alignment, technical credibility

IA REVIEW

~200 PROPOSALS

IAs consider:
mission, strategic, and RC alignment; technical quality

IA REVIEW

~100 NEW PROJECTS

Grand Challenges: Bold high-risk ideas with significant potential for national impact

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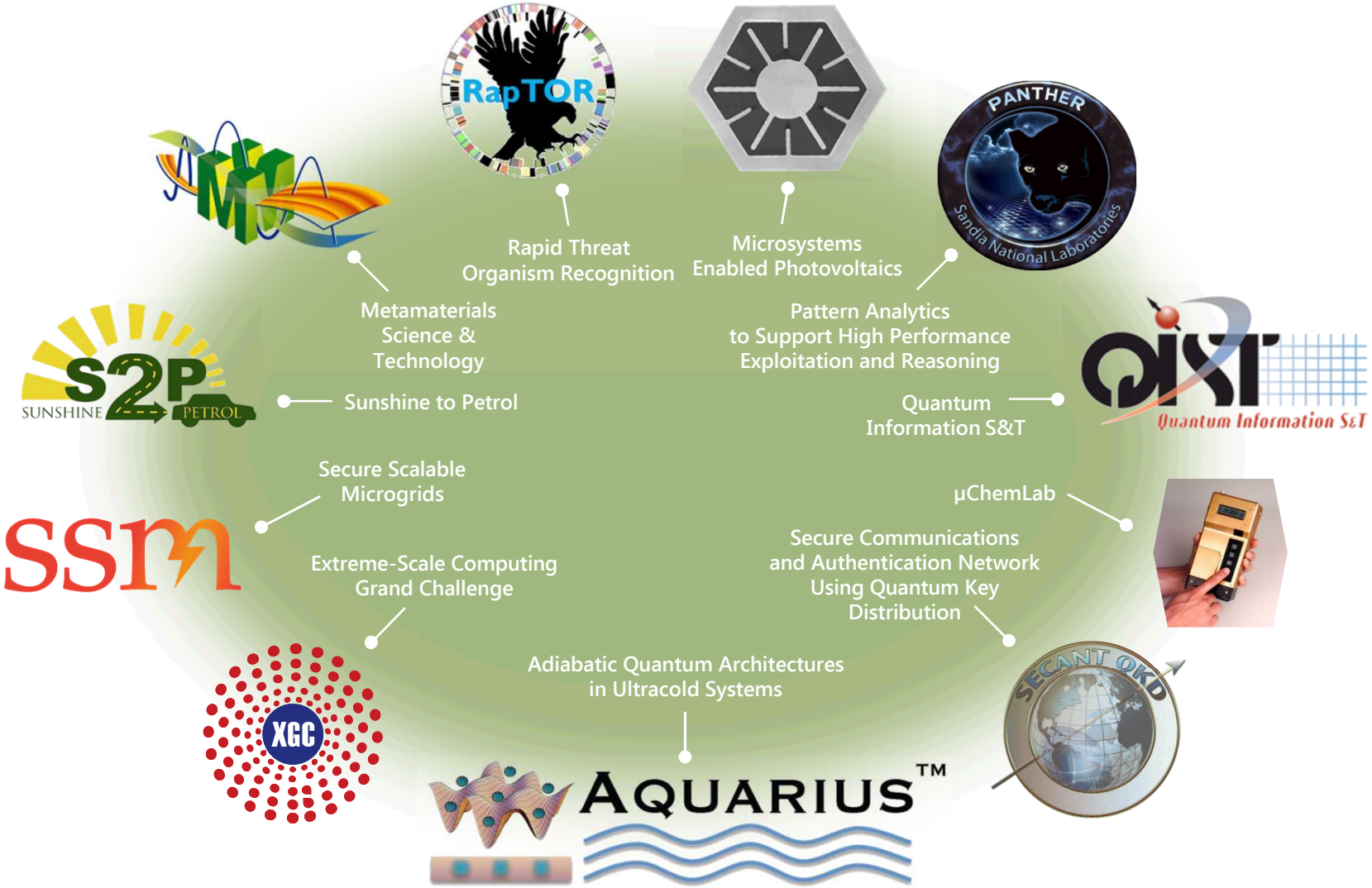

EAB charter

The EAB will assess and provide external, independent review and guidance to the Grand Challenge (GC) team and Sandia National Laboratories' management on the GC's strategy, relevance, quality, capabilities, and impact.

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Research Assessment Elements and Focus Questions

Strategy *Research strategy is clear, having strategic goals, areas of research focus, competitive analysis, and measures of success.*	▪ If we are successful, how and where will the GC be transformative? ▪ What do you see as the 1-3 biggest areas of risk for the GC's strategy?
Relevance *Research enables the Labs' national security missions, benefits Sandia, DOE/NNSA, and the nation.*	▪ Where do you see our work having the highest relevance? ▪ How could we increase the relevance?
Quality *Research is high quality and at the leading edge, and is performed with high integrity and fidelity.*	▪ What is your view of the quality of the research plan? ▪ What aspects of the planned research are leading edge?
Workforce / Capabilities *Research enables the attraction, retention and development of Sandia's technical staff, and the development of differentiating capabilities.*	▪ Where can the project strengthen Sandia's technical base the most? ▪ What would you anticipate to be the GC's long-term S&T legacy?
Impact *Research leads to outcomes supportive of strategic goals, such as S&E leadership, technology deployment and intellectual property.*	▪ Does the GC have an effective plan to engage with the broader community? ▪ What else would greatly enhance the impact of our GC?

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Backups

Research Challenges

Focused research campaigns that complement Research Foundations

Current mature Research Challenges:

- **Power on Demand**
- **Science & Engineering of Quantum Information Systems**
- **Trusted Systems & Communications**
- **Detection at the Limit**
- **Engineering of Materials Reliability**

Under development

- Data Science
- Engineering Abiotic/Biotic Living Systems
- First to High-Yield Fusion
- Resiliency in Complex Systems
- Revolutionary Approaches to the Stockpile
- Beyond Moore Computing

Research Challenge attributes:

- Decade-scale “moon shot” efforts
- Targeted at technical breakthroughs necessary for mission areas
- Executed by Communities of Practice across the Labs
- Generate roadmaps that guide the broader R&D effort

Research strategy is an extension of the Lab strategy

Sandia National Laboratories

Labs' Strategic Objectives

1. Amplify our national security impact
2. Strengthen our Laboratories' foundation to maximize mission impact
3. Advance an exceptional work environment that enables and inspires our people in service to our nation

Research Strategy Goals

1. Provide critical differentiation in the delivery of mission through the research portfolio
   - **Research Foundation** strategy development, maturation, and implementation
2. Tackle ground-breaking inter-disciplinary research challenges that create transformational opportunities in national security
   - **Research Challenge** identification, maturation, and implementation
3. Steward and nurture a vibrant, problem-rich research environment
   - **State of the Research Environment**
   - **Research Quality Standards**

Why research challenges?

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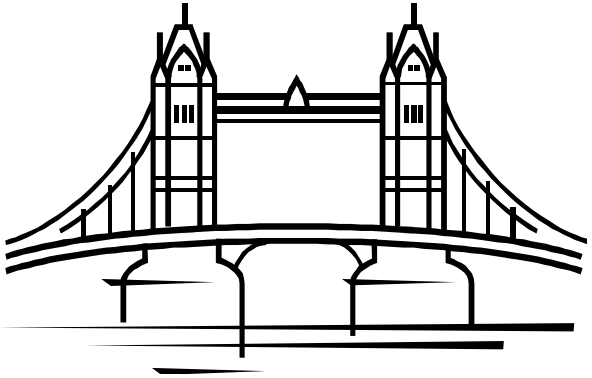
Research challenges organize previously unconnected researchers working on similar problems

Research challenges connect interdisciplinary research programs to mission critical technical obstacles

Research challenges cross the "valley of death" to deliver national security solutions



Research challenges are a bridge between the research and mission communities