Sandia National Laboratories

SAND2014-3254P

2014 SPRING MANAGERS' MEETING

Preparing for the FUTURE TODAY

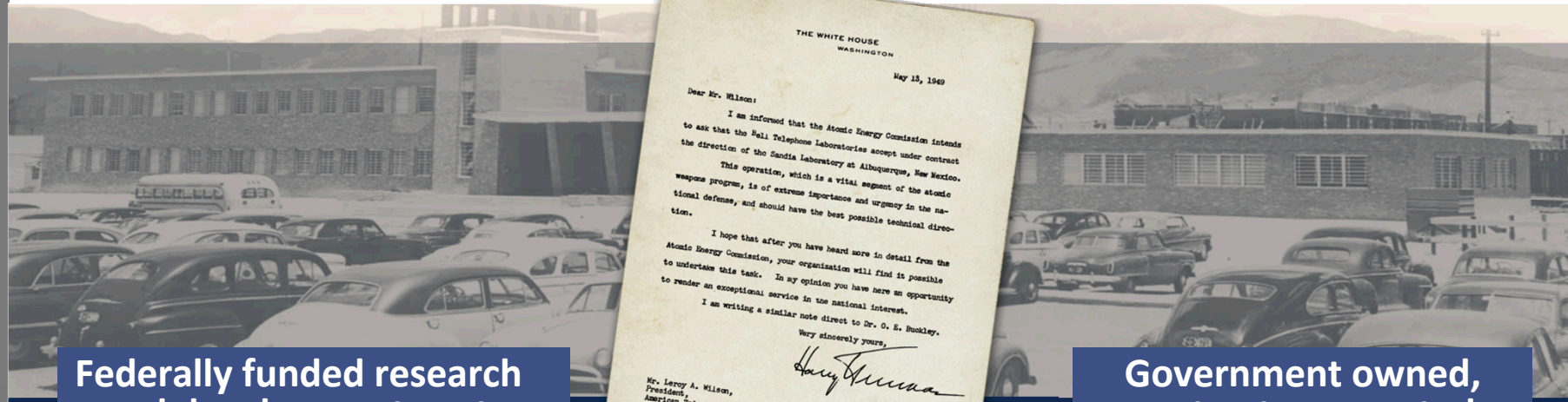
LABS' FOUNDATION: RESEARCH

Julia M. Phillips, Ph.D.
Vice President and Chief Technology Officer

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 2014-3254P

Sandia National Laboratories

A broad national security lab, with a unique nuclear weapons mission and diverse customer base



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.

Federally funded research and development center

Government owned, contractor operated

Sandia's Research Objective

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

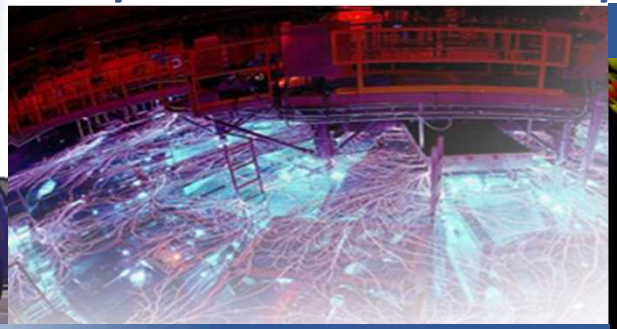




Research Foundations

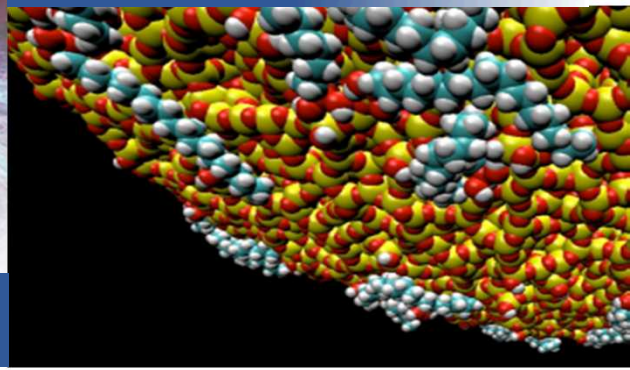
Effective delivery in our distinct mission space requires a long-standing commitment to maintain discipline-based ST&E competencies

Computing & Information Sciences

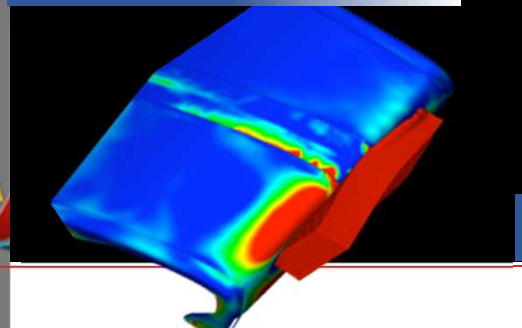


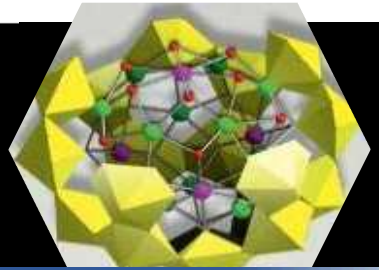
Radiation Effects & High Energy Density Science

Materials Science



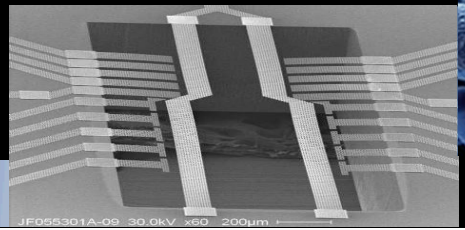
Engineering Sciences





Geoscience

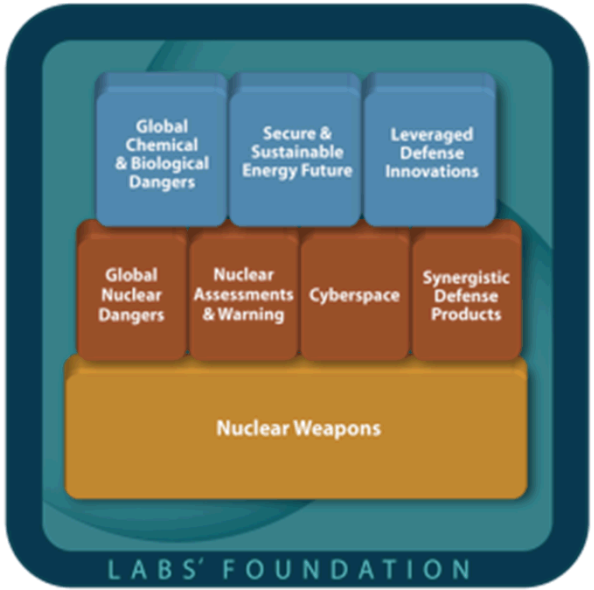
Nanodevices & Microsystems



Bioscience

Our Focused National Security Missions

Interdependent Mission Areas develop strategies to address future national needs and amplify our national security impact



People + Research + Facilities & Tools = Capabilities

Our Research Strategy

Research challenges connect interdisciplinary research efforts with cross-cutting, long-term mission achievement

Interdisciplinary Research Challenges tackle mission critical technical obstacles to create new transformational technologies

Enduring foundational and applied research

Enduring national security mission achievement

Research Challenge Characteristics

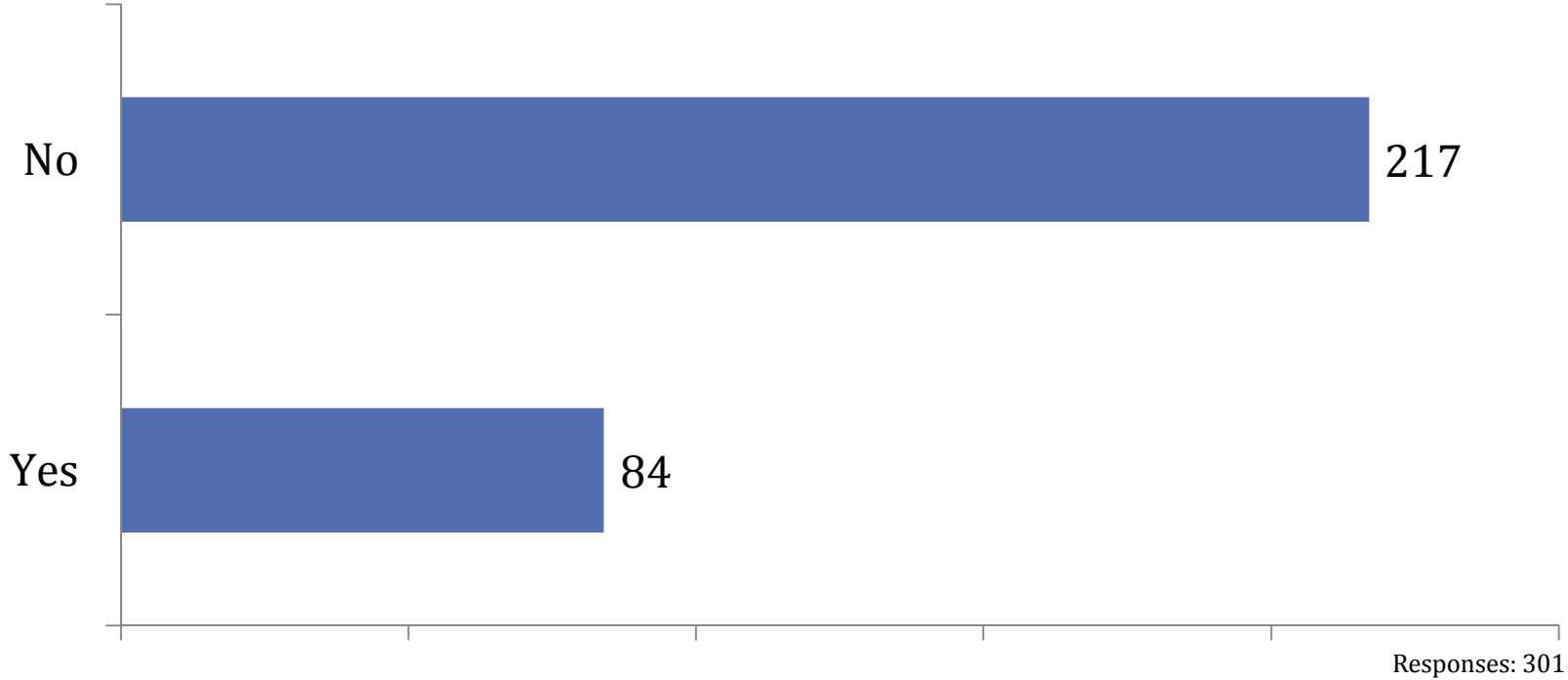
Focused research programs, guided by roadmaps and supported by a funding portfolio, with a commitment to reach well-defined goals

- Advances the frontiers of science and engineering
- Surmounts a critical path technical obstacle for a mission challenge
- Long-lived, with a measurable endpoint
- Integrates in multiple dimensions
- Requires partnerships

Sandia's Research Challenges

- Beyond Moore Computing
- Data Science
- First to High-Yield Fusion
- Trusted Systems and Communications
- Detection at the Limit
- Engineering of Materials Reliability
- Cyber Resiliency
- Resiliency in Complex Systems
- Science & Engineering of Quantum Information Systems
- Revolutionary Approaches to the Stockpile
- Power on Demand
- Integrative Biological Systems Analysis and Engineering

Is today the first time you have heard about Sandia's Research Challenges?



Responses: 301

Example: Power on Demand

Research Foundation	Research Goals	Mission Area
Radiation Effects & High Energy Density Science	**Advances in generation, storage, and conversion ==>** High efficiency, ultra-light and high reliability compact electrical power systems	Secure and Sustainable Energy Future
Materials Science	**Predictive reliability of power system components ==>** New devices and systems with enhanced lifetimes, reliability, and resilience	Nuclear Weapons
Nanodevices & Microsystems	**Novel approaches** for generating and harvesting power for long times in harsh environments (e.g., rad hard)	Leveraged Defense Innovations
Engineering Sciences		Nuclear Assessments and Warning
		Synergistic Defense Products

The LDRD Program

Key to achieving our Research Objective and a tool for realizing our Labs Strategy

- Sandia's only source of discretionary R&D funding
- Essential for maintaining the critical science, technology, and engineering capabilities required to carry out our national security mission
- Supports high-risk, mission-driven research that pushes the frontiers of science and engineering
- Helps attract and retain outstanding scientists and engineers

FY15 LDRD Portfolio Overview

- **Research Foundations** – Nurture disciplinary competencies AND advance Research Challenges
- **Mission Foundations** – Advance Mission Area strategies AND develop PMU-relevant capabilities (and advance Research Challenges)
- **Grand Challenges** – Advance Research Challenges and Mission Area strategies
- **Early Career LDRD** – Included in Research Foundations and Mission Foundations
- **Corporate Investments** – Includes Exploratory Express projects and Campus Executive Program
- **"Out of the Box" Ideas** – Supported by New Ideas and Exploratory Express Investment Areas
- **CHALLENGE:** Congress has limited the size of the LDRD program to 6% of Lab costing (down from 8%)

Research Quality Standards

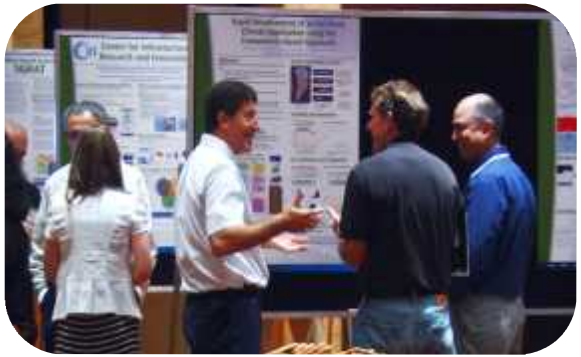
Posted on CTO website:
https://cto.sandia.gov/prodevel.html

- Printed and posted on the CTO website in November 2013
- Approved by Lab Leadership Team in February 2014 for Labs-wide use
- Distribution (in progress):
  - Hardcopy –> R&D managers & Sandia executives
  - Electronic version –> Staff
  - Discussions at center/department meetings
- Fifty case studies cover all phases of research to help
  - Research scientists avoid common problems that could harm their reputation and career
  - Mentor and advise new researchers
  - Assure our customers that our research is of the highest integrity

Partnerships

Essential for Labs success

- Partnerships strategy goals
  - **Enable Sandia's national security missions**: Translate research to mission impact
  - **Create and maintain an ideal partnerships environment**: Establish a culture and environment that embraces partnerships
  - **Lead the DOE Complex in technology transfer**: Create 21st century model



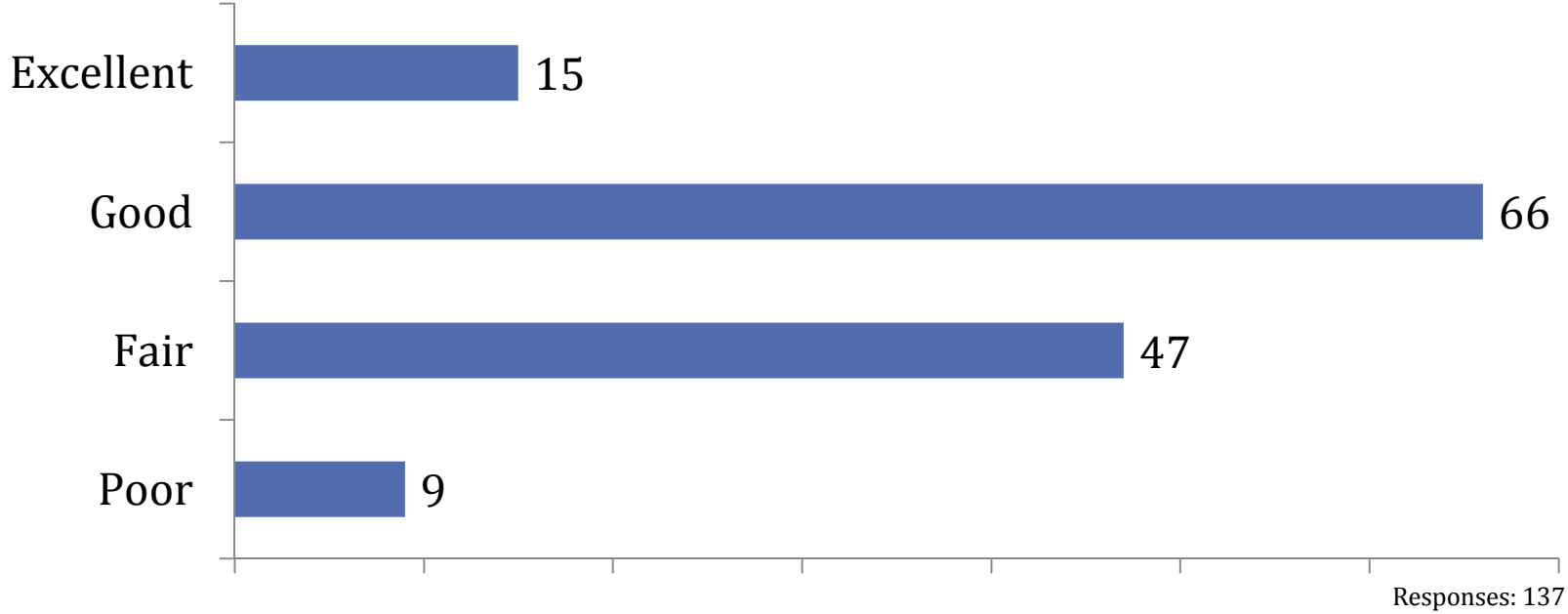
We Need a Variety of Partners

- **Industrial Partnerships** facilitate Sandia's ability to meet its national security and technology transfer missions and enable technologies to be deployed for the public good
  - Increased, more intentional IP protection: 40% increase in patent applications in 1 year
  - More than 800 active IP licenses
  - Over 220,000 open source software downloads in 2013
  - Sandia Science & Technology Park: 2,400 employees; 36 companies & organizations
  - New Mexico Small Business Assistance program: $39M in assistance to over 2,000 Mexico businesses
- **University Partnerships** nurture talent, enable collaborative research in focused research areas, and build national advocacy
  - 23 Campus Executive universities; $2M yearly LDRD research investment
  - $33.8M university research investment in FY13
  - Sandia/UNM Joint Hire Program
  - Truman Fellowship

CTO Priorities and Challenges

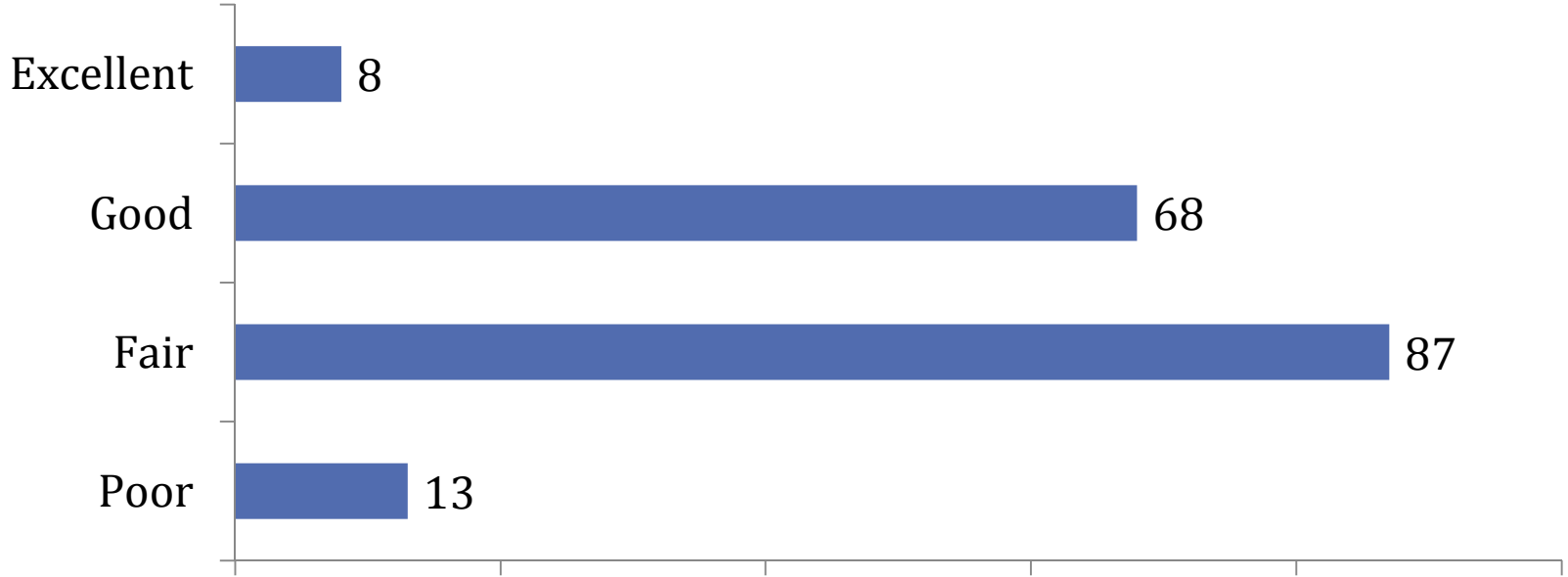
- **Priorities**
  - Research-Mission integration
  - Research Challenge execution
  - LDRD program alignment with Labs strategy
  - External communications/LDRD advocacy
  - Research environment including metrics tracking
  - Partnerships strategy implementation
- **Challenges**
  - Conference attendance
  - Talent acquisition and retention
  - LDRD funding
  - Publication rates
  - Technology maturation to facilitate technology transfer

If you are in a Mission Support organization (e.g., HR, Business Support, Facilities): How would you assess the state of you work environment?



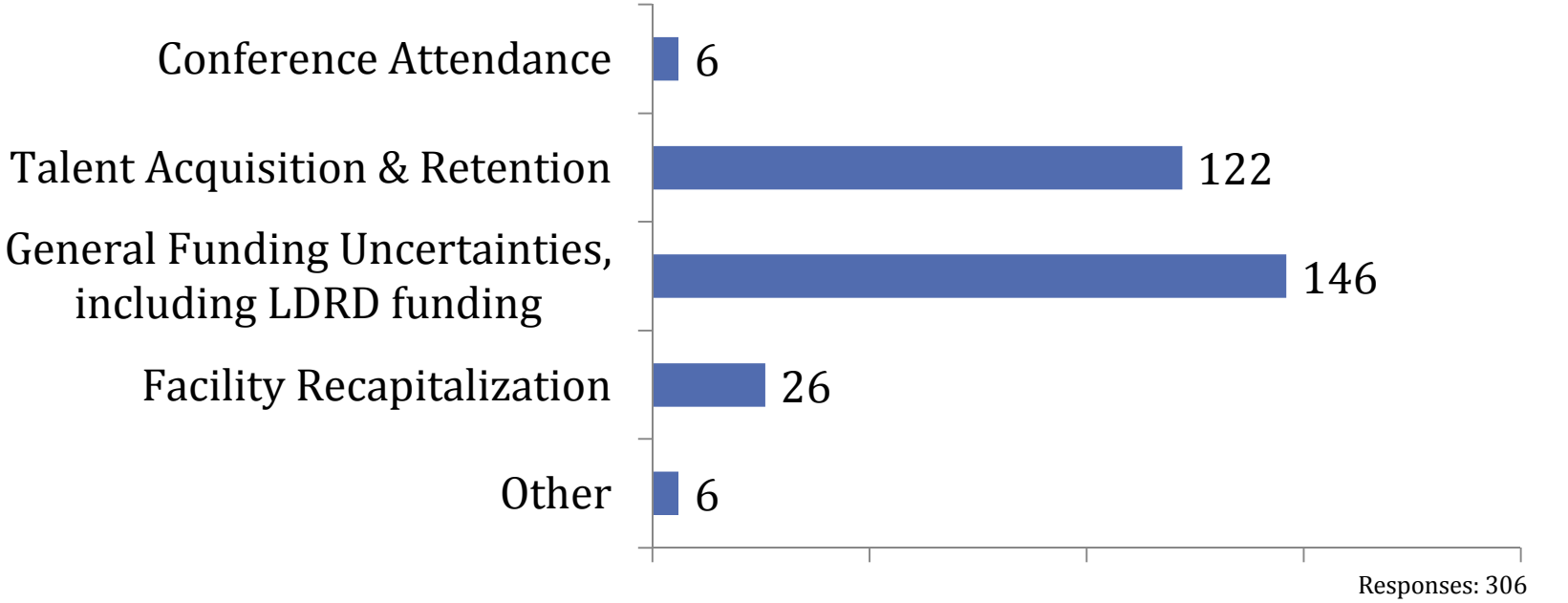
Responses: 137

If you are in an R&D or Engineering organization: How would you assess the state of the R&D environment?



Responses: 176

Which of the following do you see as the biggest challenge facing the health of science & engineering at Sandia?



Responses: 306