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Exceptional service in the national interest

Sandia National Laboratories

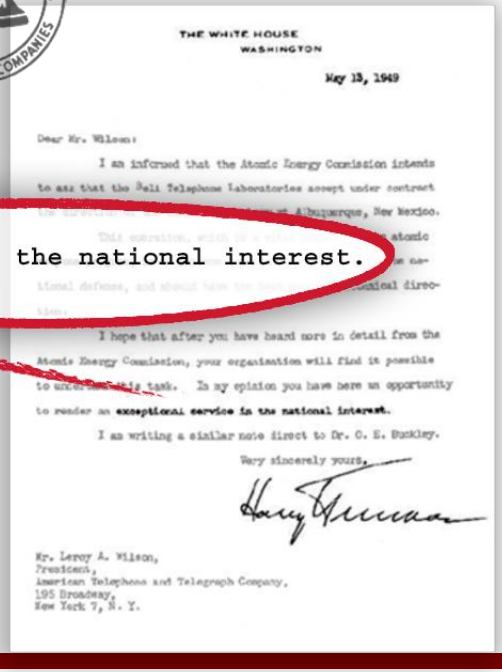
Sandia National Laboratories: *An Overview*

Robert W. Leland

Director, Computing Research (1400)

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's History



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 [redacted] at Albuquerque, New Mexico. This operation, which is a [redacted] atomic [redacted] national defense, and should have the [redacted] national 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. C. E. Buckley.

Very sincerely yours,

Harry Truman

Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

exceptional service in the national interest.

Executive Management
Programmatic Reporting Structure

Paul Hommert
President & Laboratories Director

Jerry McDowell
Deputy Lab Director
& EVP for National Security Programs

Program Integration

Mike Vahle, Actg.
Defense Systems and Assessments

Jill Hruby
International, Homeland, and Nuclear Security

Rick Stulen
Energy, Climate and Infrastructure Security

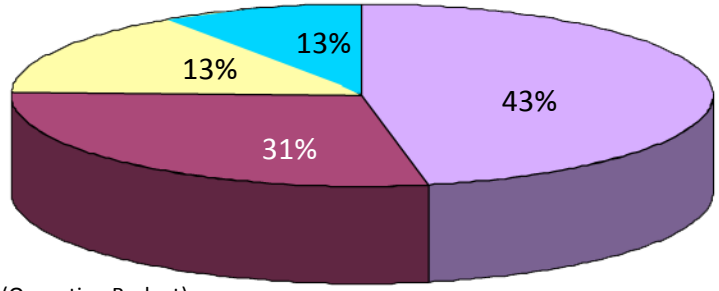
Steve Rottler
Weapon Systems and Technology Program

Carolyne Hart
Stockpile and Weapon Product Realization

People and Budget (As of October 15, 2010)

- On-site workforce: 11,677
- Regular employees: 8,607
- Gross payroll: ~$898.7 million

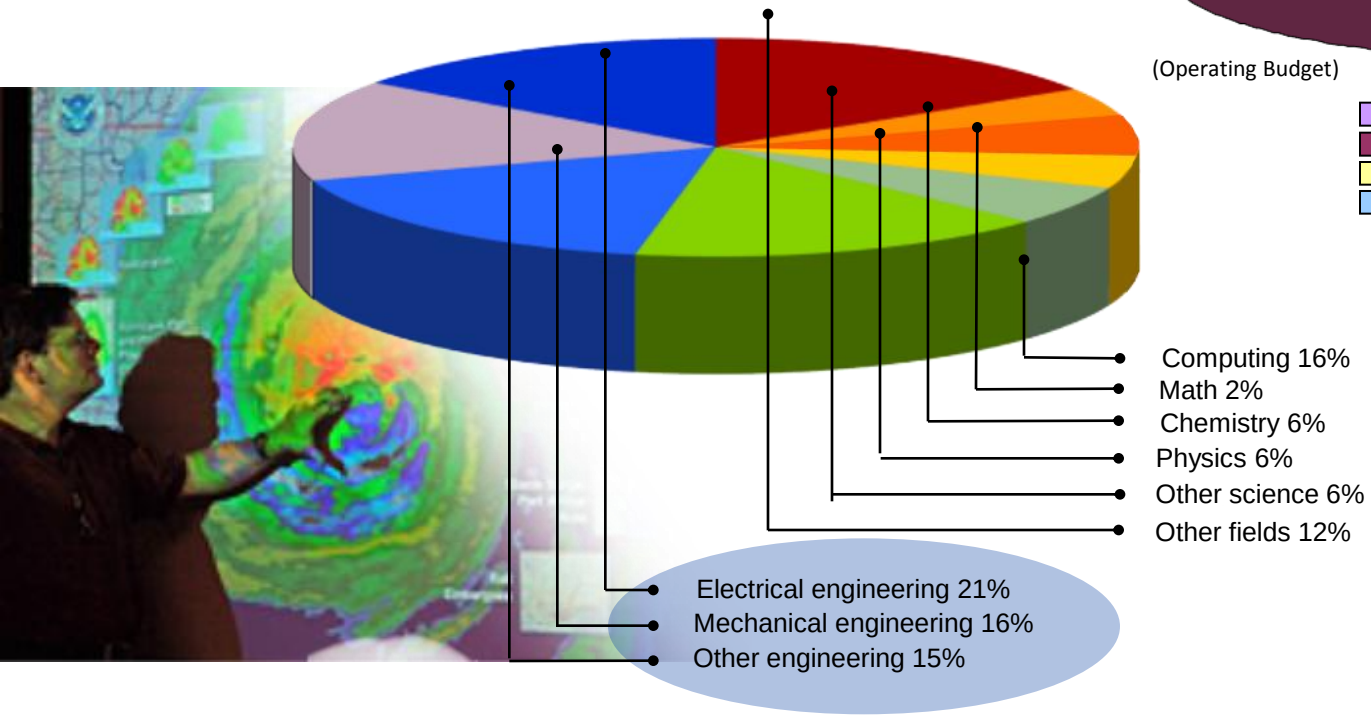
FY10 operating revenue
$2.3 billion



(Operating Budget)

- Nuclear Weapons
- Defense Systems & Assessments
- Energy, Climate, & Infrastructure Security
- International, Homeland, and Nuclear Security

Technical staff (4,277) by discipline:



Addressing Our Evolving National Security Environment is of the Greatest Importance

Traditional strategic nuclear threats

Threats from other nation states

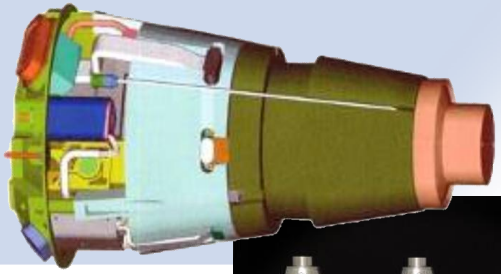
Threats from non nation states

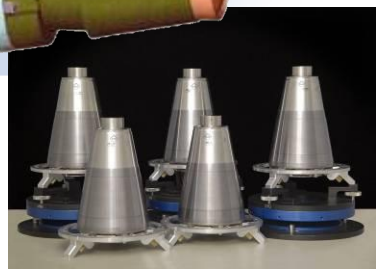
Threats of tech surprise

Other threats: natural disasters, climate change, energy supply

Nuclear Weapons - Core Products

Integrated, engineered warhead systems

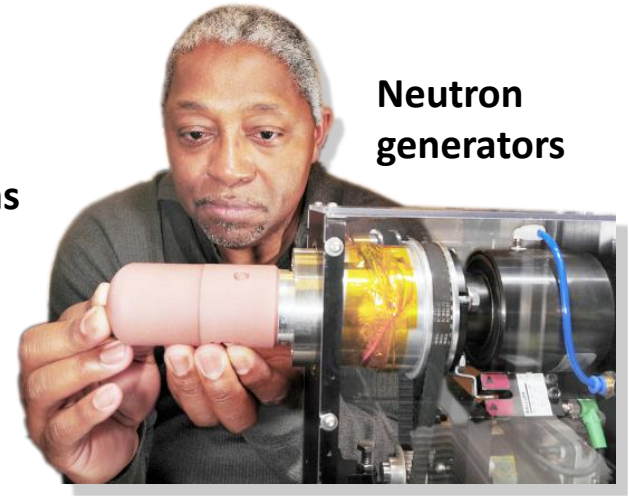




Arming, fuzing, and firing systems

Safety systems

Gas transfer systems



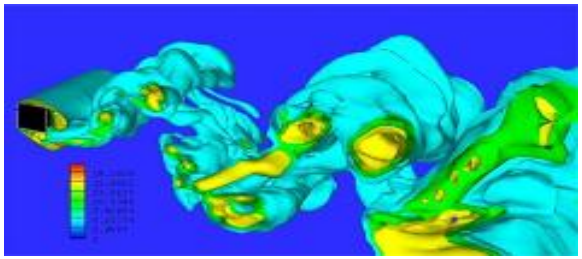
Neutron generators

Nuclear Weapons

High reliability, high consequence of failure, challenging environments, and technology solutions - Facilities and Capabilities

Microelectronics and microsystems

Design, fabricate, package, and test trusted semiconductor components



Computational simulation

High-performance hardware and software tools to enable solutions requiring massively parallel computers

Environmental testing

Simulate environmental conditions and collect relevant data for systems, subassemblies, and components

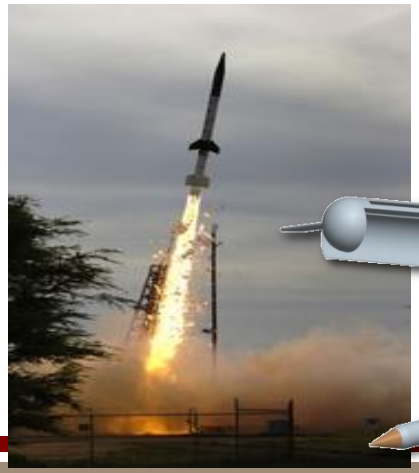
Defense Systems and Assessments

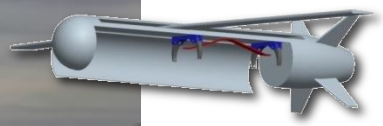
Program Areas

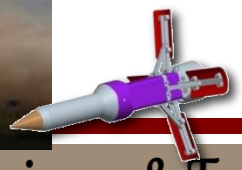
- Information Operations
- Integrated Military Systems
- Proliferation Assessment
- Remote Sensing & Verification
- Space Mission
- Surveillance & Reconnaissance
- Science & Technology Products

Areas of Expertise

- Nuclear Detonation Detection System
- Nonproliferation
- Cyber Security
- Synthetic Aperture Radar
- Space Situational Awareness
- Data Processing and Exploitation
- Augmented Cognition & Training







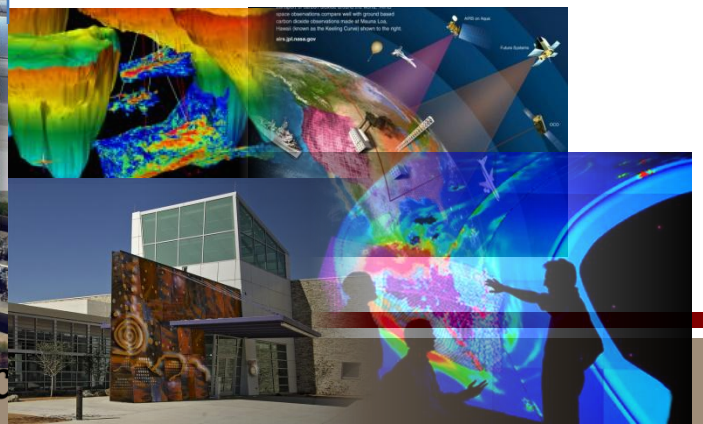
Energy, Climate, and Infrastructure Security

Program Areas

- Infrastructure Security
- Energy Security
- Climate Security
- Enabling Capabilities

Areas of Expertise

- Modeling & Analysis, Cyber, Electricity Distribution, and Energy Assurance
- Renewables, Energy Efficiency, Energy for Transportation, and Nuclear Energy Systems
- Sensing & Monitoring, Carbon Capture, Sequestration, Modeling and Analysis, and Water
- Discovery Science & Engineering, Systems Analysis, and Regulatory & Policy



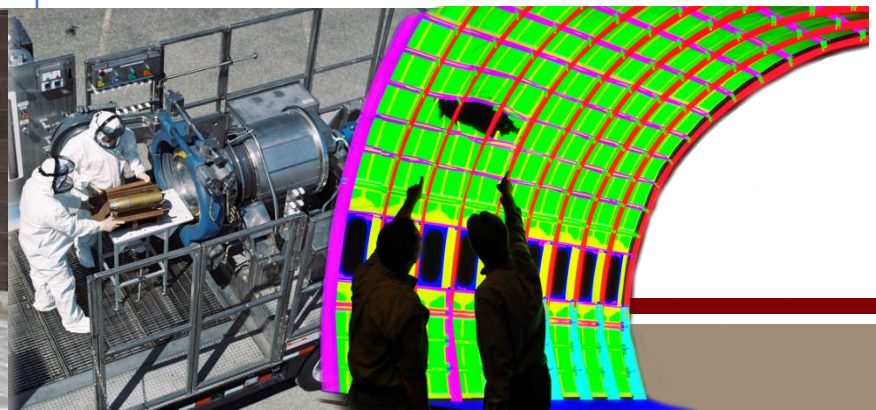
International, Homeland, and Nuclear Security

Program Areas

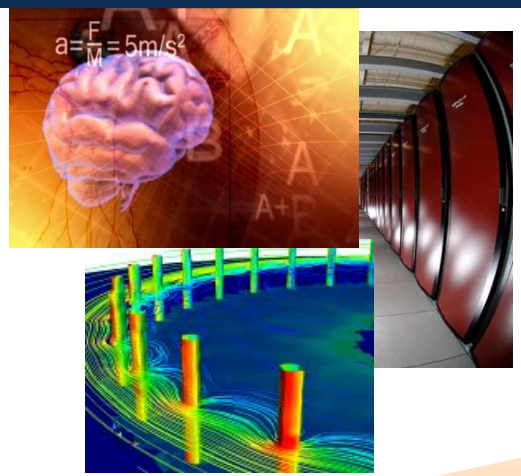
- Critical Asset Protection
- Global Security
- Homeland Defense and Force Protection
- Homeland Security

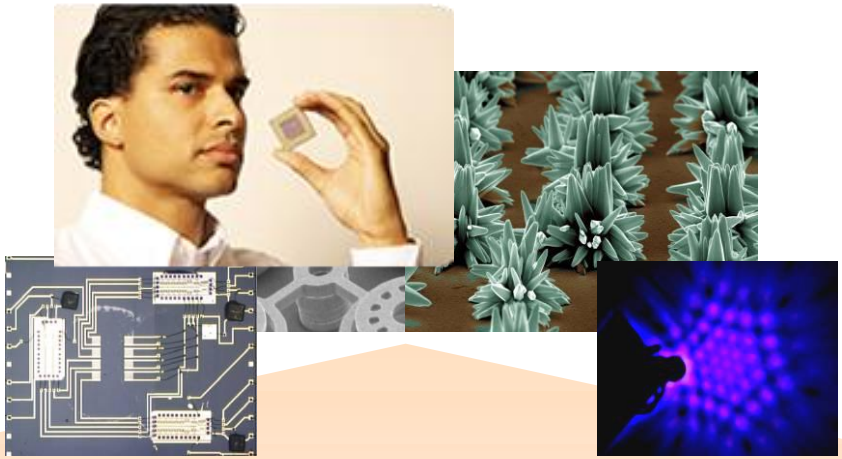
Areas of Expertise

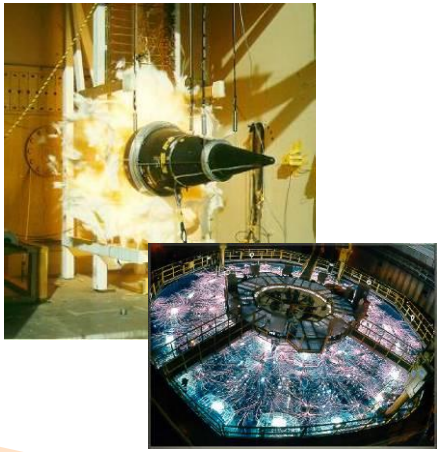
- Countering Bioterrorism
- Nuclear, Radiological, and Chemical Risk Reduction
- Nonproliferation and Arms Control
- Physical Security
- Emergency Response
- Systems Analysis and Engineering
- Border Security
- Aviation and Airworthiness Security
- Human Factors

Science & Technology Research Disciplines Drive Capabilities





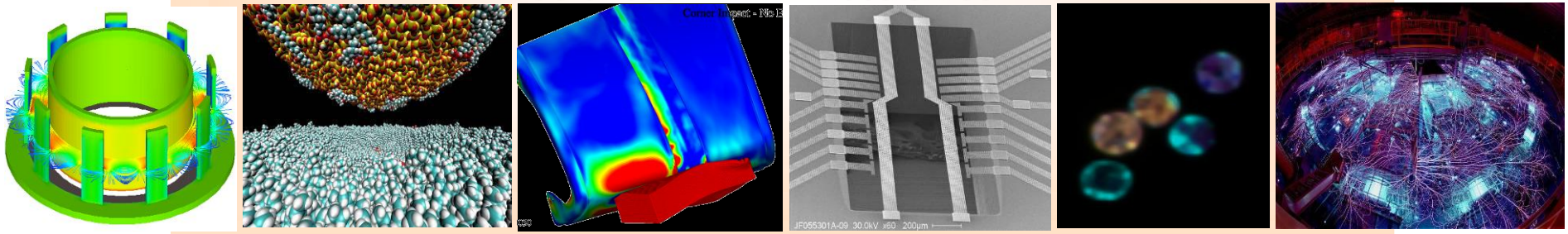


High Performance Computing

Nanotechnologies & Microsystems

Extreme Environments

Computer Science | **Materials** | **Engineering Sciences** | **Micro Electronics** | **Bioscience** | **Pulsed Power**



Research Disciplines

Exceptional service in the national interest

Sandia National Laboratories

Computing Research Center: 1400 Overview

Main message

We remain a strong and vital organization that is very actively adapting to define our own future

Key supporting messages

- ✓ We have made a number of substantial and important changes this year
- ✓ These changes reflect our efforts to address five “core” issues we have identified as critical to our future
- ✓ Our annual performance remains strong and we are adapting how we measure that to support the changes we are making

Progress on five “core” issues

Center identity

- Name change, co-location

Strategic focus

- Campaigns and line of sight work, measurement approach, dialogue on open questions

Organizational structure

- Re-factoring of senior manager groups, redefining departments

Management assurance

- Business approach, Division engagement effort

Organizational culture

- Organizational feedback, driving question, Arbinger institute work, coaching etc.

Key strategic issue

Last year's "strategic imperative":

- Sustain the historical depth, breadth & excellence of our research effort
- Find ways to increase the actual & perceived mission impact of our work

Sandia CTO "strategic principles"

- Assure mission enablement (Internal impact)
- Advance ST&E frontiers (Technical excellence)

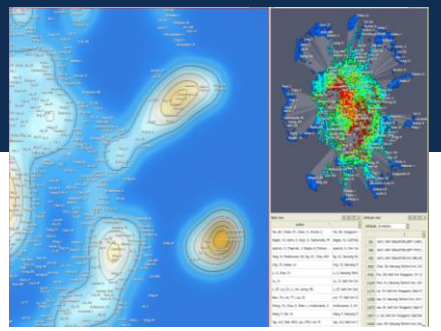
Center 1400 Management Team's "driving question"

- How do we enhance the mission relevance (actual and perceived) of Center 1400,
- (Without sacrificing technical excellence and external presence)

Strategic campaign goals

Cyber

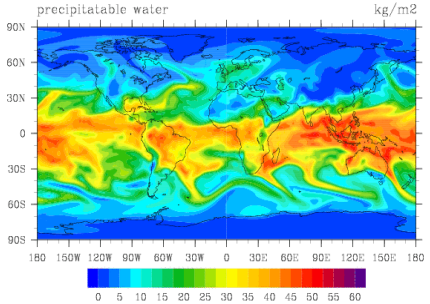
- Make CERI a success as an open cyber research initiative at Sandia
- Develop innovative solutions to Sandia cyber applications
- Identify strategic cyber research directions, such as addressing the human element (attacker, defender, user)



Key capabilities for Cyber Defense

Energy and Climate Security

- Assess national and international prosperity and security risks by modeling climate and human response at the regional level with quantified uncertainty
- Grow leadership in climate science through the use of uncertainty quantification, algorithms and scalable software development on high performance computing
- Enhance the sustainability of current fossil fuel technologies to reduce national security risks
- Contribute to nuclear energy safety, performance and economy improvements through national initiatives
- Partner with government and industry on computational science for energy technology



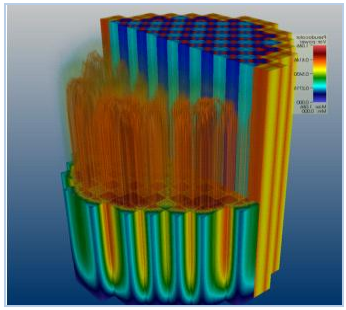
HOMME earth simulation with 100km model on 96k cores

GreenHouse Gas Information System (GHGIS) is Partnership (JPL/LANL/LLNL/SNL) to Provide Climate Change Monitoring

Strategic campaign goals (cont.)

Extreme Computing

- Design and influence DOE pre-Exascale and Exascale systems to meet Sandia application needs related to scientific computing and analytics
- Lead the transition of applications and systems software into the next era of computing
- Develop computing breakthroughs via collaborations in architectures, algorithms, materials, microelectronics, and physics
- Address the massive data to decision problem through text analysis, human performance research



SNL is leading member of the CASL hub proposal for advancing the design of nuclear reactors.

Nuclear Weapons

- Increase our technical and programmatic engagement with NW
- Integrate our technology and expertise into NW/DSW, with particular emphasis on electrical systems and QMU

Cognitive Science

- Brain-inspired Computing Architecture
- Data-to-decisions: FY12 Grand Challenge seedling: $445K

Reorganization objectives

Continue to grow our impact

Senior Managers felt change was needed

- 1430 was too big, too diverse
- Concern over stove-piping within current groups
- Concern over losing focus on high-end computing
- Under discussion for more than a year

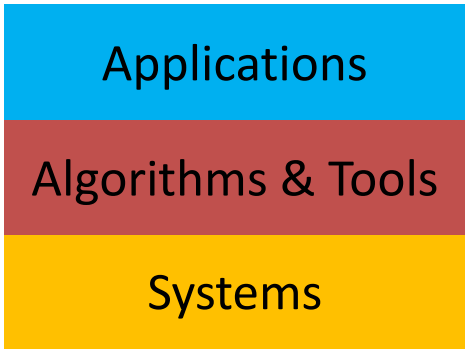
Desire to better integrate/leverage Cognition

- Stewardship responsibility to the Lab
- Exciting new possibilities

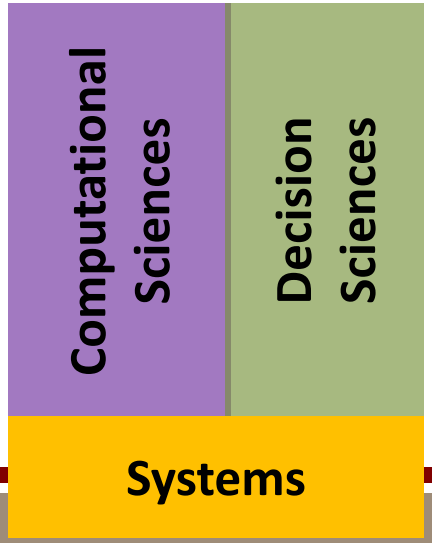
Better steward our competencies

- Alignment around senior managers primary passions
- Embrace co-design and decision sciences opportunities
- Improve vertical integration
- Create a sense of renewal

The way we were



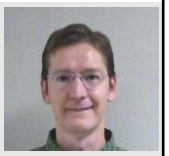
The way we are



Computing Research Center

Rob Leland, Director

Extreme-scale Computing Dept. 1420 Sudip Dosanjh, Senior Manager	
Scalable Computer Architecture Dept. 1422 Jim Ang	
Scalable System Software Dept. 1423 Ron Brightwell	
Advanced Device Tech. Dept. 1425 John Aidun	
Scalable Algorithms Dept. 1426 Robert Hoekstra	

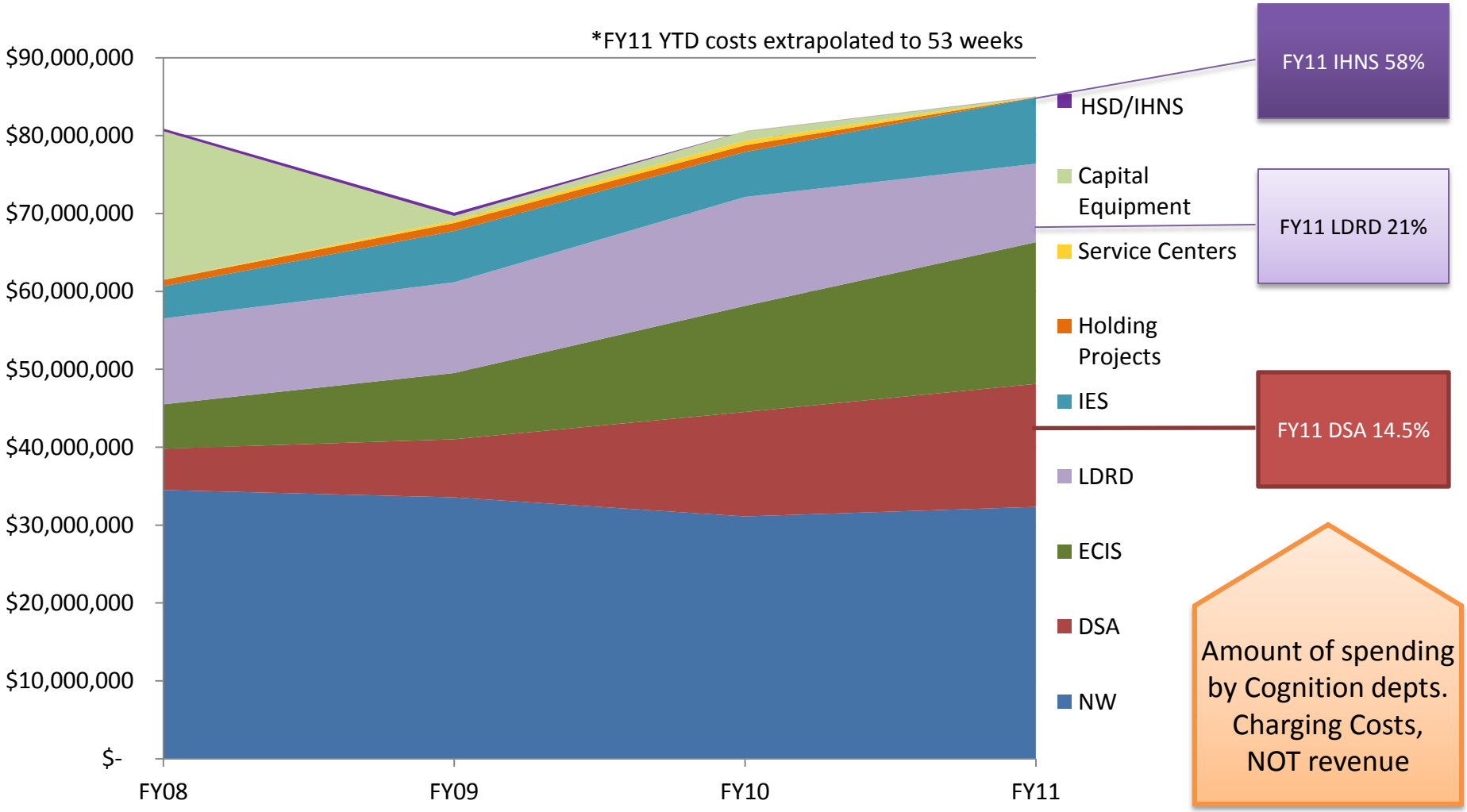
Computational Sciences & Math Dept. 1440 Bruce Hendrickson, Senior Manager	
Optimization & Uncertainty Quant. Dept. 1441 James Stewart	
Numerical Analysis & Apps. Dept. 1442 S. Scott Collis	
Computational Shock & Multiphysics Dept. 1443 O. Erik Strack	
Multiphysics Simulation Tech. Dept. 1444 Randall Summers	
Electrical Systems Modeling Dept. 1445 Scott A. Hutchinson	

Information & Cognitive Science Dept. 1460 John Mitchiner, Senior Manager	
Scalable Analysis & Visualization Dept. 1461 David H. Rogers	
Cognitive Modeling Dept. 1462 John Wagner	
Cognitive Systems Dept. 1463 Phil Bennett	
Data Analysis & Informatics Dept. 1464 William Hart	
Discrete Math & Complex Systems Dept. 1465 Danny Rintoul	

Computational Sciences | **Decision Sciences** | **Systems**

Cognitive Science & Technology

1400 funding history – Spending costs



Cyber Engineering Research Institute (CERI)

CERI Objectives

- **Co-locate Sandia Cyber S&T activities to accelerate and deepen Sandia's Mission Impact**
- **Outreach to primary cyber experts and leaders in industry and academia**
- **Push the frontiers of science through Cyber S&T advancements**
- **Grow the next generation of cyber talent for the nation**

Summary and highlights

- Reorganization of Computing Research center to integrate cognitive science
- Co-location in CERI to increase center collaborations and external partnerships
- Commitment to engage in Cognitive Science program efforts
  - Brain-inspired computing architecture
  - Performance Review