

**Advanced Scientific Computing Research Program** 

## ADVANCED SCIENTIFIC COMPUTING RESEARCH

**Facilities Overview** 



### Department of Energy Organizational Structure

#### **Advanced Scientific Computing Research Program**

#### DEPARTMENT OF ENERGY Office of the Secretary Federal Energy Dr. Samuel Bodman, Secretary Departmentai Staff Regulatory Chief of Staff and Support Offices Commission Clay Sell, Deputy Secretary\* Assistant Secretary Assistant Secretary Office of the Office of the Office of the for Policy & for Congressional & Under Secretary International Affairs Under Secretary Under Secretary for Intergovernmental Affair For Nuclear Security/ Science Administrator for General Counsel Health, Safety & National Nuclear David K. Garman, Dr. Raymond L. Orbach, Security Security Administration Under Secretary Under Secretary for Science Amb. Linton F. Brooks Chief Financial Economic Impact & Diversity Assistant Secretary Deputy Administrator for Energy Efficiency Office of Science for Defense Programs & Renewable Energy Energy Information Inspector General Administration Deputy Administrator Assistant Secretary Advanced Scientific for Environmental for Defense Nuclear Computing Research Hearings Management Nonproliferation Chief Information & Appeak Assistant Secretary Deputy Administrator for Naval Reactors Fossil Energy Human Capital Intelligence and Biological & Environment Research Assistant Secretary for Deputy Under Secretary Nuclear Energy for Counter-terrorism Affairs Civilian Associate Administrator Radioactive Waste for Defense Nuclear Management Security High Energy Physics Associate Administrato Electricity Delivery & Energy Reliability Southeastern Power for Emergency Bonneville Power Operations Administration Administration Associate Administrator Warldores Davelor Legacy Management for Infrastructure Western Area Power Teachers & Scientic & Environment Administration Administration ssociate Administrator for Management & Administration

<sup>\*</sup> The Deputy Secretary also serves as the Chief Operating Officer

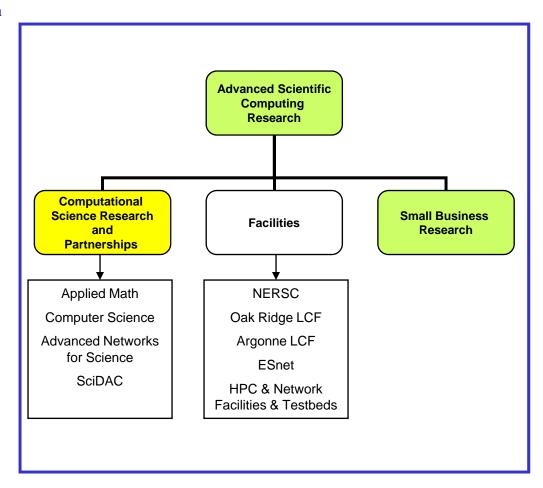


### Advanced Scientific Computing Research

**Advanced Scientific Computing Research Program** 

ASCR Mission: Steward of DOE's Computational Science, Applied Mathematics, Computer Science, High-Performance Computing and Networking Research for open science. Deploy and operate high performance computing user facilities at LBNL, ANL, and ORNL

ASCR Vision: Best in class advancing science and technological innovation through modeling and simulation



http://www.science.doe.gov/ascr



## ASCR High Performance Computing Resources

**Advanced Scientific Computing Research Program** 

### High Performance Production Computing Facility (NERSC)

- Delivers high-end capacity computing to entire DOE SC research community
- Large number of projects (200 300)
- Medium- to very-large-scale projects that occasionally need a very high capability
- Annual allocations

### Leadership Computing Facilities

- Delivers highest computational capability to national and international researchers through peer-reviewed Innovative and Novel Computational Impact on Theory and Computation program
- Small number of projects (10 20)
- Multiple year allocations



### **Current Computing Facilities**

**Advanced Scientific Computing Research Program** 

#### NERSC (www.nersc.gov)

- 10 Teraflop IBM SP 375 RS/6000 (Seaborg) with 6080 processors, 7.2 terabytes aggregate memory
- 6.7 Teraflop IBM Power 5 (Bassi) with 888 processors, 3.5 terabytes aggregate memory
- 3.1 Teraflop LinuxNetworx Opteron cluster (Jacquard) with 712 processors, 2.1 terabytes aggregate memory

### LCF at Oak Ridge (nccs.gov/leadership/index.html)

- 119 teraflop Cray XT3/XT4 (Jaguar) with 11,708 dual core AMD Opteron processor nodes, 46 terabytes aggregate memory
- 18.5 Teraflop Cray X1E (Phoenix) with 1,024 multi-streaming vector processors,

### Argonne LCF (www.alcf.anl.gov)

 5.7 Teraflop IBM Blue Gene/L (BGL) with 2,048 PPC processors









# Future Computing Facility Upgrades

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#### ALCF

- -100 teraflop IBM Blue Gene/P delivered by end of FY 2007
- -250-500 teraflop upgrade to IBM Blue Gene/P in late 2008



- -Cray XT4 upgraded to 250 TF by end of 2007
- –1 Petaflop Cray Baker system to be delivered by end of 2008

#### NERSC

-100+ teraflop Cray XT4 in operation by October 2007









# Access to ASCR Computing Resources

**Advanced Scientific Computing Research Program** 

- Base NERSC Allocations
  - Managed by Programs
  - New 2008 Call for Proposals Summer 2007
     <a href="http://www.nersc.gov/nusers/accounts/allocations/ercap/">http://www.nersc.gov/nusers/accounts/allocations/ercap/</a>

### INCITE

 New 2008 Call for Proposals for over 250 Million processor hours of INCITE allocations should be announced in mid-May at http://hpc.science.doe.gov

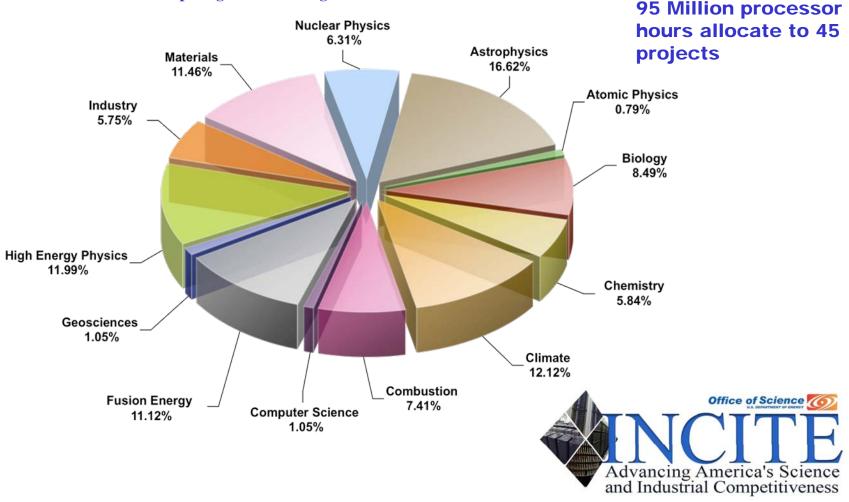


# Innovative and Novel Computational Impact on Theory and Experiment-INCITE

- Initiated in 2004
- Provides Office of Science computing resources to a small number of computationally intensive research projects of large scale, that can make high-impact scientific advances through the use of a large allocation of computer time and data storage
- Open to national and international researchers, including industry
- No requirement of DOE Office of Science funding
- Peer-reviewed
- 2004 Awards: 4.9 Million processor hours at NERSC awarded to three projects
- 2005 Awards: 6.5 Million processor hours at NERSC awarded to three projects

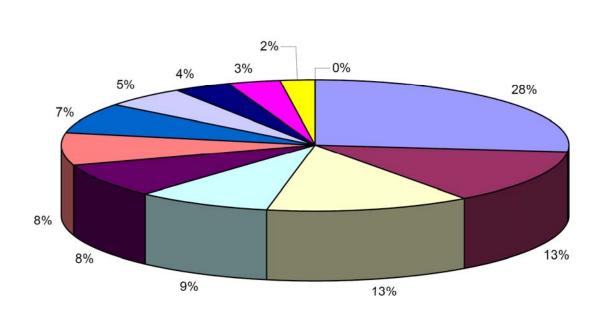


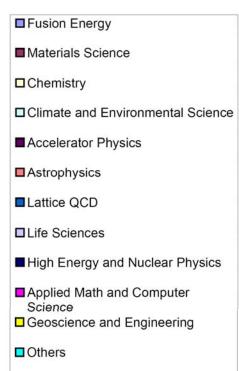
## 2007 INCITE Allocations by Disciplines





## 2006 NERSC Utilization by Discipline



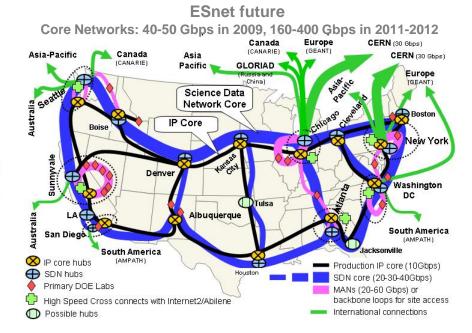




## ESnet (www.es.net)

#### **Advanced Scientific Computing Research Program**

#### **ESnet Spring 2006** Core network 10 Gbps SINet (Japan) Russia (BINP) CA\*net4 Australia (AARN Canada (CA\*net4) Italy, UK, etc. GLORIAD Taiwan (TANet2) (Russia, China) Taiwan (TANet2, Korea (Kreonet2 ASCC) (USLHCnet CERN+DOE funded ESnet IP core 42 end user sites Office Of Science Sponsored NNSA Sponsored (12) nternational (high speed) 10 Gb/s SDN core Joint Sponsored (3) Other Sponsored (NSF LIGO, NOAA) 2.5 Gb/s IP core ESnet IP core: Packet over Laboratory Sponsored (6) MAN rings (> 10 G/s) SONET Optical Ring and Hubs OC12 ATM (622 Mb/s) commercial and R&E peering points OC12 / GigEthernet SNV ESnet core hubs OC3 (155 Mb/s) high-speed peering points with Internet2/Abilene 45 Mb/s and less





### A Stealth ASCR/ASC Project

