NERSC Users Group Meeting
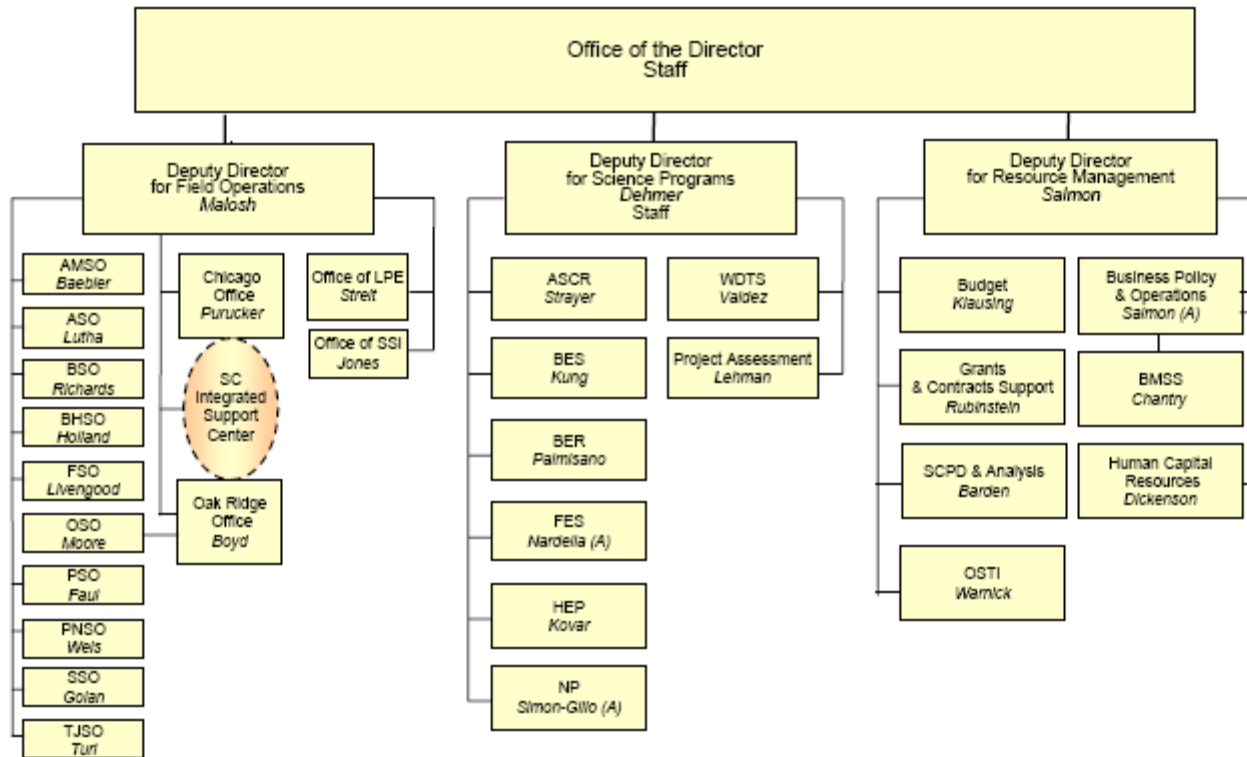# Department of Energy Update
October 3, 2008

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301-903-5997

Department of Energy Organizational Structure

Advanced Scientific Computing Research Program

OFFICE OF SCIENCE

Office of the Director
Staff

Deputy Director
for Field Operations
Malosh

Deputy Director
for Science Programs
Dehmer
Staff

Deputy Director
for Resource Management
Salmon

AMSO
Baebler

ASO
Lutha

BSO
Richards

BHSO
Holland

FSO
Livengood

OSO
Moore

PSO
Faul

PNSO
Weis

SSO
Golan

TJSO
Turi

Chicago
Office
Purucker

SC
Integrated
Support
Center

Oak Ridge
Office
Boyd

Office of LPE
Streit

Office of SSI
Jones

ASCR
Strayer

BES
Kung

BER
Palmisano

FES
Nardella (A)

HEP
Kovar

NP
Simon-Gillo (A)

WDTS
Valdez

Project Assessment
Lehman

Budget
Klausing

Grants
& Contracts Support
Rubinstein

SCPD & Analysis
Barden

OSTI
Warnick

Business Policy
& Operations
Salmon (A)

BMSS
Chantry

Human Capital
Resources
Dickenson

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ASCR's Mission

Advanced Scientific Computing Research Program

The mission of the Advanced Scientific Computing Research (ASCR) program is to deliver forefront computational and networking capabilities to scientists nation-wide that enable them to extend the frontiers of science, answering critical questions that range from the function of living cells to the power of fusion energy. In the past two decades, leadership in scientific computation has become a cornerstone of the Department's strategy to ensure the security of the nation and succeed in its science, energy, environmental quality, and national security missions.

Facilities Division Draft HPC Strategic Plan

Advanced Scientific Computing Research Program

- ASCR's ten-year "terascale to exascale" strategic plan will focus primarily on HPC computing resources and research and evaluation testbeds, and the investment needed to stand-up prototypes at the extreme-scale – hundreds of petaflops and beyond – for scientific discovery in the 2014-2017 timeframe.

- The key strategic principles that guide ASCR facility investments include:
  - Provide support for a broad range of scientific disciplines.
  - Tightly couple pioneering scientific applications and a portion of ASCR's computer science and applied mathematics portfolio with the development of the next generation of HPC resources.
  - Identify and conquer barriers to success while continually evaluating both risk and reward.
  - Maintain a balance between high performance production and leadership class computing with input from the Advanced Scientific Computing Advisory Committee (ASCAC) and the mission needs of the other program offices in the Office of Science

www.sc.doe.gov/ascr/Misc/ASCRFacilitiesStrategicPlan.pdf

Differences between NERSC and LCFS

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 (400)
  - Large number of users (3,100)
  - Medium- to very-large-scale projects that occasionally need a very high capability
  - Annual allocations through ERCAP
- **Leadership Computing Facilities (OLCF and ALCF)**
  - Delivers highest computational capability
  - Small number of projects (20-30)
  - Small number of users (300)
  - Computationally intensive projects that require the highest capability available
  - Multiple-year allocations through Innovative and Novel Computational Impact on Theory and Experiment (INCITE)

ASCR FY2009 Budget-1

(FY 2007=$275.7M; FY 2008=$351.2M; **FY 2009=$368.8M**)

Advanced Scientific Computing Research Program

Facilities Division:

High Performance Production Computing will support the operation of NERSC for nearly 3,100 Office of Science supported users. (FY 2007=$37.6M; FY 2008=$54.2M; **FY 2009=$54.8M**)

Leadership Computing Facilities (LCFs) will continue to provide open access to high performance resources for the scientific community through the INCITE program. The Argonne LCF will operate a 500 teraflop IBM Blue Gene system and the Oak Ridge LCF will operate a one-petaflop Cray system. (FY 2007=$94.9M; FY 2008=$110.2M; **FY 2009=$115.0M**)

ASCR FY 2009 Budget-2

High Performance Network Facilities and Testbeds will support continued operations of ESnet and related testbeds including continued upgrades to optical technologies that will deliver 40-60Gbps connectivity. The increase in bandwidth is critical to meeting the growing requirements for Department applications and facilities (FY 2007=$21.80M; FY 2008=$24.3M; **FY 2009=$25.0M**)

Research and Evaluation Prototypes will continue to support the DARPA HPCS partnership's development of the Cray architecture and, in partnership with NNSA and IBM, support the development of the Blue Gene Q architecture. (FY 2007=$14.3M; FY 2008=$23.1M; **FY 2009=$17.0M**)

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NERSC Performance Measures

- DOE reviews NERSC's effectiveness through various performance measures:
  - 2007 NERSC OA Recommendations follow-up (Francesca will report)
  - 2008 NERSC OA in August 2008 (Francesca will report)
  - PART Metric: 70 (baseline - 40)% of computing cycles used on Seaborg was for jobs that required at least 1/8 (768) processors of the total resource [FY08 OA]
  - The 2007 User Satisfaction Survey showed excellent overall satisfaction – 6.3/7.0 [FY08 OA Review].

NERSC Mission and You

From ASCR's Mission:

"…deliver forefront computational and networking capabilities to scientists nation-wide that enable them to extend the frontiers of science"

- NERSC delivers High-Performance Computational Resources and Support very effectively.
- And… **we cannot do it without the USERS!**
  - **We need your feedback through User Satisfaction Survey.**
  - **We acknowledge NERSC in Publications.**

Everything is about Enabling Scientific Discovery.

AY 2009 Allocation of NERSC Resources

Advanced Scientific Computing Research Program

- **70+% -- Office of Science Mission Related (ERCAP)**
  - Call for proposals issued for NERSC resources
  - Two kinds of allocations: Target and Over-Target
  - Target is proportionate to the prior year share of both Target and Over-Target
  - SC-2 establishes Over-Target allocations for Program Offices
  - Associate Directors or their designees review proposals in their area and determine final detailed allocations
  - New allocation year starts in mid January, 2009
- **10% -- Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program**
  - 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 and computational readiness reviewed
- **Up to 10% -- Reserved for Director, Office of Science (SC-1)**
- **10% -- Reserved for NERSC Director (LBNL)**
- **Allocation Unit is Processor Hours (Franklin-Equivalent), not MPP**

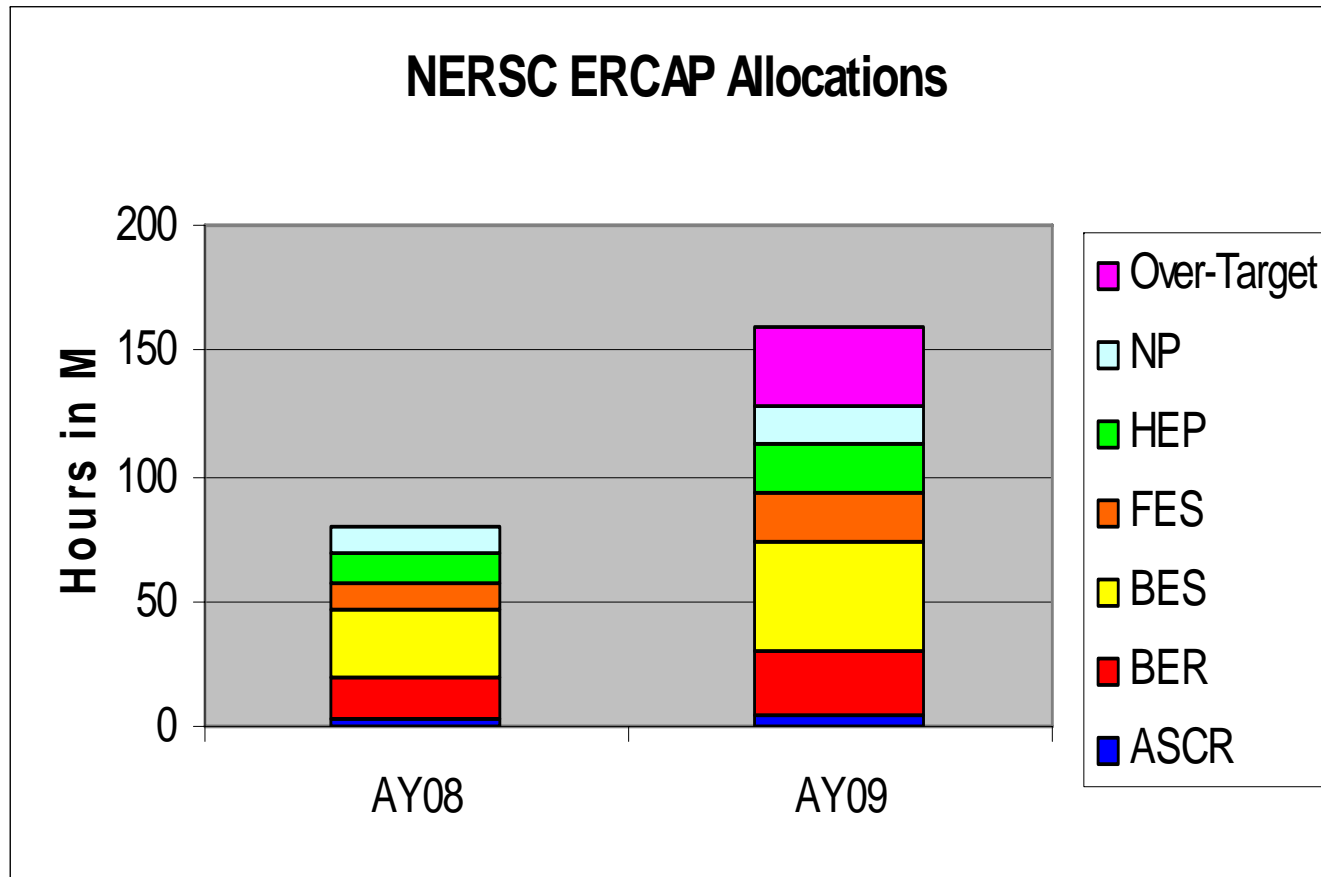# NERSC Hours Available to Program Offices

Advanced Scientific Computing Research Program

AY Year	Category	Hours (MPP)	Hours (Processor Hours)
2008	**SC Programs**	**475.0M**	**79.2M**
	INCITE	67.9M	11.3M
	SC-1	67.9M	11.3M
	NERSC Dir	67.9M	11.3M
	Total	678.5M	113.1M
2009	**SC Programs**	**960.0M**	**160.0M**
	INCITE	120.0M	20.0M
	SC-1	120.0M	20.0M
	NERSC Dir	120.0M	20.0M
	Total	1,320.0M	220.0M

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Detailed ERCAP Allocations

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Critical Dates

- Aug 18th: Proposals may be submitted to NERSC through ERCAP.
- Oct 1st: Proposals due to NERSC.
- Oct 3 : Allocation Request Forms sent to Associate Directors by ASCR
- Oct 22: Allocation Request Forms (for Target and Over-Target) due to ASCR.
- Oct 29: SC Program Offices can begin allocating Target.
- Nov 21: SC-2 Over-Target Decisions back to ASCR
- Dec 5: Program Offices complete Over-Target allocations
- Jan 13, 2009: Allocations start.

FY2008 Accomplishments

Advanced Scientific Computing Research Program

- NERSC-5 Acceptance in late October
- NERSC-6 CD-0 accepted in March
- NERSC-5 Alternative Analysis -> Quad-Core Upgrade accepted in April
- NERSC-6 Lehman Review in July
- NERSC-5 QC Upgrade started in July
- NERSC Operational Assessment Review in August
- NERSC-6 RFP released in September
- NERSC-5 QC Upgrade will complete in October
- NERSC-6 RFP will close in October
- Several "Rounds" of OMB 300
- OCIO's Quarterly Review Reports

Backup

Advanced Scientific Computing Research Program

Allocation Request Form

Advanced Scientific Computing Research Program

2009 NERSC Allocation Request Form				
Program Office:	**Advanced Scientific Computing Research**			
AY 2008 (K Proc. Hours)	**AY 2009 (K Proc. Hours)**			
Projected Usage	**Proposals**	**Target Allocation (T)**	**Over-Target Increment (O)**	**Allocation Total (O) + (T)**
3,071 (19,961 MPP)	**6,000**	**4,422**	**1,200**	**5,622**
Target Justification				
•Enable research on scaling of mathematical algorithms to thousands of processors – 2000K hours				
•Test and harden libraries and software tools developed by SciDAC Institures and Centers – 1,422K hours				
•Test system software scaling and fault tolerance – 1,000K hours				
Total SciDAC hours: 2,422K hours				
Over-Target Justification				
•Enable world peace – 300K hours				
•…..				
Total SciDAC hours: 900K hours				

INSTRUCTIONS

1. Data in Blue is pre-populated by ASCR/NERSC.
2. Your Program Office enters the data (examples shown) in Red.

NERSC Resources (AY 2002 – 2008)

Advanced Scientific Computing Research Program

NERSC Total Computing Time (ERCAP)