Office of Nuclear Physics
Exploring Nuclear Matter - Quarks to Stars

U.S. Department of Energy
Office of Science

Nuclear Physics Program

RHIC/AGS Users Meeting

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Associate Director of the Office of Science
for Nuclear Physics
June 23, 2005

Outline

- Context
- FY 2005 Program
- FY 2006 Budget
- FY 2007 Budget
- Office of Nuclear Physics

FY 2005 Program

FY 2005 SC NP funding is $404.8M (+3.9% over FY 2004)

Allows for facilities to run at ~83% of optimum utilization

- RHIC (30 weeks): CEBAF (39 weeks): ATLAS & HRIBF (9,950 hrs)
- Bates ran until end of May to complete BLAST program
- 88-Inch Cyclotron: ~3000 hrs for NP and ~2000 hrs for DOD work

Research support near constant effort (+2.6%)

- HIGS (TUNL) and TAMU upgrade underway
- GRETINA and Fundamental Neutron Physics Beamline (FNPB) underway at SNS

Science is being produced:

- State of matter with properties of a "perfect liquid": null-result for pentaquark: strangeness content of the proton: neutrino results (SNO and KamLAND)

Technical advancements:

- RHIC Cu-Cu run – exceeded projections by ~2X: record polarized proton beams
- JLAB breakthrough on high gradient SRF
- BNL's QCDOC computer (10 Teraflops : NP & HEP)

FY 2006 Budget

FY06 NP Budget Request ($370.7M) is -8.4% reduction compared to FY05

- Impacts on scientific productivity are significant:
  - Facility Operations decrease ~30% compared to FY05
  - An ~12% reduction of supported researchers, staff and students

- Funding is provided for investments for forefront scientific capabilities:
  - Continued support for GRETINA, FNPB MIEs
  - Investments in new capabilities (STAR TOF MIE and RHIC AIP EBIS)
  - R&D for proposed CEBAF 12 GeV Upgrade and RIA projects

Strong support for increased funding for SC expressed in Congress

- House Markup provided NP an additional +$37.6M ($408.3M)

- Senate Markup provide NP an additional +$49.0M ($419.7M)

FY 2006 Nuclear Physics Budget Request (millions of dollars)

	FY04	FY05	Request FY06	House Mark	Senate Mark
Research Operating	122.3	125.6	117.1		
Research Cap. Equip.	7.5	7.2	9.5		
<Research>	129.8	132.8	126.6		
RHIC	120.5	130.7	117.9		
CEBAF	74.8	77.5	70.8		
LE Facilities	23.8	24.1	22.3		
MIT/Bates	12.5	9.4	4.5		
<Operations>	231.7	241.7	215.5	+ 31.6	+ 49.0 (Full utilization) (of facilities)
12 GeV Upgrade R&D	0.7	1.5	1.5		
RIA R&D	6.0	6.7	4.0	+ 6.0	
<Facilities Initiatives>	7.7	8.2	6.5		
RHIC EBIS (AIP)	-	-	2.0		
<Construction>	0.0	0.0	2.0		
<Stewardship>	21.4	22.0	21.1		
	389.6	404.8	370.7	+ 37.6	+ 49.0
		(+3.9%)	*(-8.4%)*	*408.3*	*419.7*

FY 2007 Budget

DOE is in the midst of its FY07 budget process

- At this point - it is not clear what outyear projections for SC (and NP) will be
  (there is overall guidance for domestic discretionary funding)

- The process – NP presents proposed programs at various levels
  (starting with significant reductions and then building up)

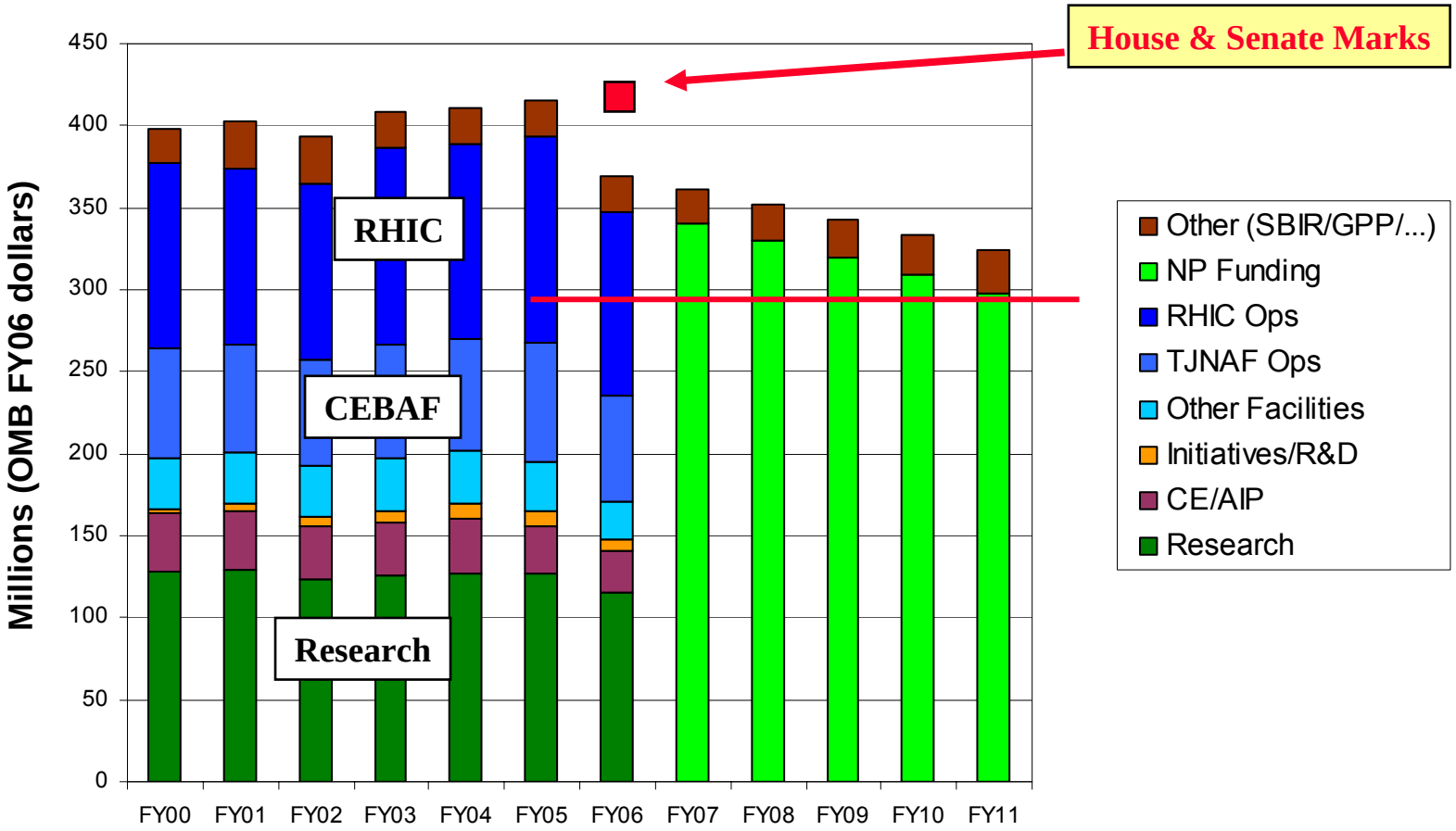
- Decision points - at the SC level, the DOE level and the OMB level
  (and ultimately the Congressional level – with Appropriations)

Input to these decisions will be:
- Priorities of SC
- Priorities of DOE
- Priorities of Administration

The NSAC Subcommittee Report (priorities under constrained funding) will be input for these decisions
(timing of the report was established to be used in the SC and DOE decisions)

Nuclear Physics Funding Projection

Projected Funding results in a ~25-30% reduction of the FY 2005 Program (assuming $370.7M funding thru FY 2011)



NSAC/Subcommittee Charge

"NSAC should examine the existing research capabilities and scientific efforts,

- assess their role and potential for scientific advancements in the context of international efforts and
- determine the time and resources (the facilities, researchers, R&D and capital investments) needed to achieve the planned programs."

"NSAC should then identify and evaluate

- the scientific opportunities and options that can be pursued at different funding levels for mounting a world-class, productive national nuclear science program."

"Your report should provide recommendations on the priorities for an optimized DOE nuclear science program over the next five years (FY 2007-2011), under the following scenarios:

- Flat-flat funding at $370.4 million, actual dollars
- Constant effort funding (starting with $370.4 million in FY 2006), inflated dollars
- Funding levels needed to restore research capabilities and scientific programs to mount an optimized program and to address the scientific opportunities identified in the 2002 Long Range Plan in order of their priority."

NSAC Subcommittee Report

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Subcommittee Findings

"The recent discovery of a new form of matter at **RHIC** with temperatures characteristic of the earliest moments of the universe presents a **dramatic science opportunity demanding further exploration.** RHIC's unique capabilities will also allow it to resolve the role of gluons in the spin of the proton."

"A QCD-driven search for exotic particles, the imaging of quarks inside protons, and precise measurements sensitive to new physics are core components of the **Jefferson Lab 12-GeV Upgrade** program. This upgrade **should proceed as quickly as possible**."

"RIA remains the **highest priority of our field for major new construction**. The subcommittee continues to be guided by the 2002 LRP, following the recommendation that **RIA can proceed only with a significant influx of new funding** to prevent premature termination of world-leading science programs at CEBAF and RHIC. Nevertheless, the **long term vision of our community** is to pursue this compelling science with a major investment."

"Nuclear physics has produced dramatic advances in neutrino science, with the demonstration of flavor change, mass, and oscillations. These discoveries open **enormous opportunities in neutrino science**."

"Nuclear physics initiatives in **fundamental symmetry tests will open a window into physics beyond the standard model.** These efforts test the very foundation of subatomic physics and must be pursued vigorously."

The **implementation of the recommendations of the NSAC Theory Report** for increased investments in manpower and computing infrastructure is critical to the overall success of the nuclear science program.

Subcommittee Response

Five funding scenarios:

- NCE-LRP level – restore program to a near constant level of effort LRP recommendation – no RIA construction
- FY07 funding at ≈ $25 M below NCE LRP and constant level of effort
- FY07 funding at ≈ $45 M below NCE LRP and constant level of effort

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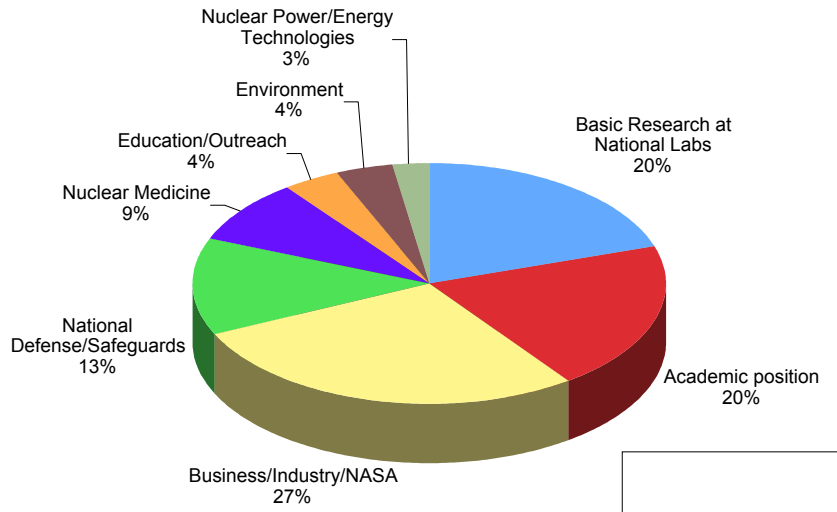
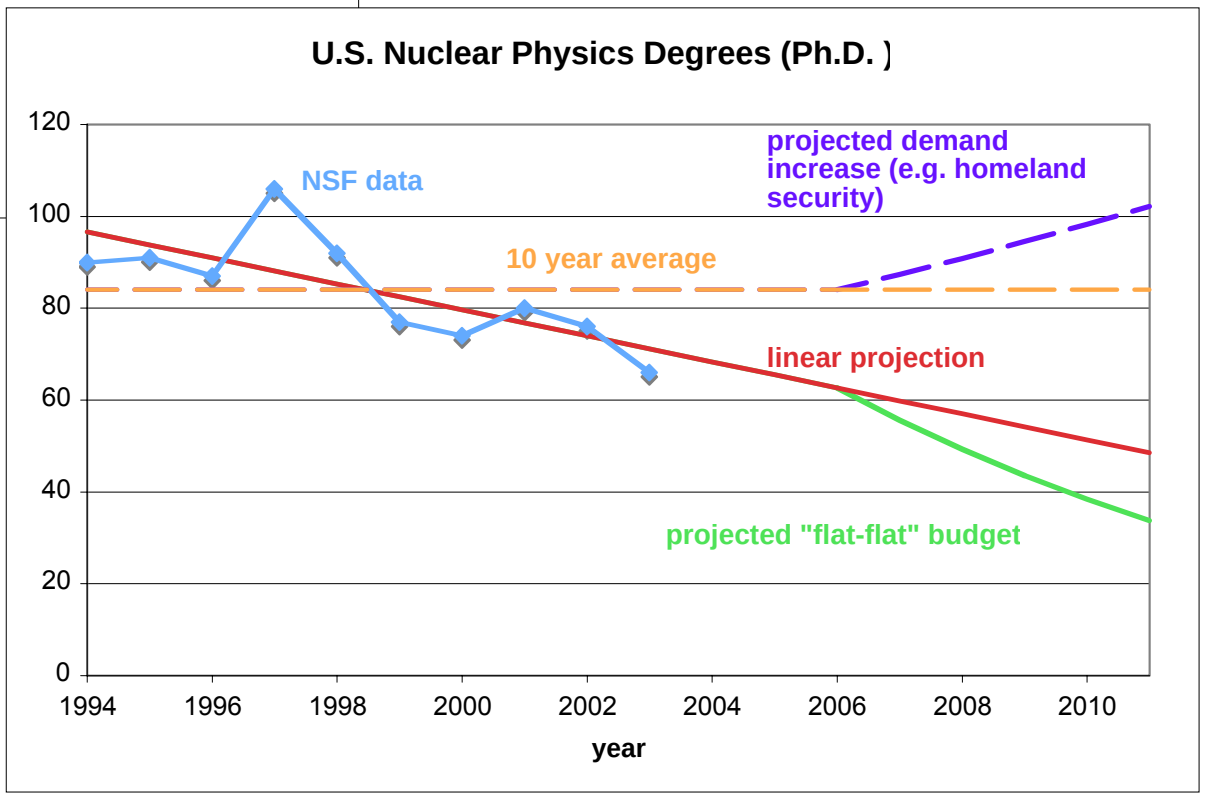
- Constant effort funding (starting with $370.4 million in FY06), inflated dollars
- Flat-flat funding at $370.4 million, actual dollars

Consequences related to the Nuclear Workforce



Nuclear Science Ph.D. careers

The NSAC Subcommittee on Education reported in November 2004 that the demand for Nuclear Physics Ph.D.s was roughly equal to the 10 year average from 1994 to 2003. Increased demand, especially for homeland security areas, is estimated for this report from the national labs.



The linear downward trend is accelerated by estimating the effect of "flat-flat" funding in Nuclear Physics funding starting in FY07. At the end of the planning period, FY11, the demand for Ph.D.'s exceeds the supply by a factor of 3.

Subcommittee Guidance

"A substantial reduction of annual budgets below the FY05 level will force us to give up a large part of our current strategic advantage without scientific justification. Such a development would constitute a major blow to the scientific competitiveness of our nation. We are hopeful that it can be avoided."

Below this - cannot operate both RHIC and CEBAF: Both scenarios examined

"Decades of careful planning and domestic and foreign investment into unique facilities have resulted in many important discoveries and remarkable payoffs. The subcommittee recognizes that under either scenario, the nation and its foreign partners will suffer a tremendous loss in science and the U.S. will no longer be able to maintain international leadership in at least one of the subfields of nuclear science. Because of the superb science lost in both scenarios, the committee was not able to make a choice based on scientific merit alone. The present budget scenario, however, represents a crisis that would preclude running both large facilities simultaneously and force an immediate choice while RHIC is still in its initial discovery phase. Based on this additional consideration, the subcommittee, while split in its decision, has a slight preference for the choice that maintains operation at RHIC. If such a budget exercise were to occur in the future, for instance, with the Jefferson Lab 12-GeV Upgrade well underway, a different choice might well be made."

NSAC Report

The Report re-enforces my assessment that the U.S. nuclear physics program is producing outstanding science today and that this is the case because of the investments made in the last decade in forefront research capabilities.

I believe that the Report does a good job of articulating what science and benefits can be realized and what is lost at different levels of funding.

I believe that Report presents an outstanding case for the importance and benefits to society of adequate funding for the Office of Science Nuclear Physics program.

The U.S. Nuclear Physics program has a great story to tell – its scientific and technical accomplishments over the last decade have been impressive and the potential for the future is equally impressive given the resources to realize it.

Subcommittee Membership

Ani Aprahamian
Peter D. Barnes
Richard F. Casten (ex-officio)
Gordon Cates
Donald Geesaman
Charles Glashausser
Edward Hartouni
David Hertzog
Xiangdong Ji
Gail McLaughlin
Curtis Meyer
Alice Mignerey
Richard Milner
Berndt Mueller
Witold Nazarewicz
Michael Ramsey-Musolf
Hamish Robertson
Bradley Sherrill
Michael Smith
James Symons
Robert Tribble (chair)
Steven Vigdor
William Zajc

Nuclear Physics Office Activities

NSAC will be changing to a "expert" advisory panel

- Members will be "experts" instead of "representatives"
- Members become temporary special federal employees
- Starting in FY 2006

Scheduled Reviews (relevant to RHIC/BNL)

• Annual BNL S&T Review	July 6-8, 2005
• Laboratory Nuclear Theory Group Review	July 20-22, 2005
• EBIS Review	July 25-27, 2005
• STAR TOF (MIE) Review	August 22-23, 2005

Office of Nuclear Physics (NP)

- Two Division Directors (selection thru the SES process)
- Program Manager for Advanced Technologies R&D (closed June 1st)
- Detailee and IPA positions vacant - please contact our office if interested

Office of Nuclear Physics

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Office of Science

Office of Nuclear Physics

Dennis Kovar, Associate Director
Deputy Associate Director
Cathy Slaughter, Administrative Assistant

Director's Office Staff
Lee Schroeder IPA
Cathy Hanlin
Brenda May

Physics Research Division
Director (vacant)
Eugene Henry: Acting
Program Assistant (vacant)

Medium Energy Nuclear Physics
Brad Tippens

Heavy Ion Nuclear Physics
Gulshan Rai

Low Energy Nuclear Physics
Eugene Henry
+ Detailee / IPA (vacant)

Nuclear Theory & Nuclear Data
Sidney A. Coon
+ Winston Roberts

Facility & Project Management Division
Director (vacant)
Jehanne Simon-Gillo: Acting
Program Assistant (vacant)

Facility Management
+ Detailee / IPA (vacant)

Project Management
Jehanne Simon-Gillo
+ Blaine Norum

Laboratory Operations
James Hawkins

Advance Technology Research and Development Program Manager (vacant)

+ Detailee/IPA