



Office of Science  
U.S. Department of Energy

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# NSAC Meeting November 1, 2002

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# ***FY 2002: Key Activities and Accomplishments***

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## **New Research Programs Have Produced Significant Results:**

- SNO: Established the solar neutrino flux
- RHIC: Data have revealed tantalizing results

## **Facilities Performing Well:**

- CEBAF, Bates, ATLAS, HRIBF, and 88-Inch Cyclotron
- University accelerators (TAMU, TUNL, Washington and Yale)

## **Priority Initiatives Supported:**

- KamLAND and MiniBoone started data taking
- HIGS, LANSCE neutron experiments, LEGS upgrade on cost and schedule
- SciDAC Projects (Astrophysics & Lattice Gauge)
- R&D for proposed Rare Isotope Accelerator (RIA)

## **NSAC Long Range Planning and Guidance:**

- Major priorities and recommendations of Long Range Plan established
- NSAC reviewed the Low Energy program

## **Nuclear Physics Division:**

- Operations Reviews (RHIC, TJNAF and HRIBF)
- Workshop on Role of NP research community in Combating Terrorism (with NSF)
- Incorporation of Performance Measures into Budget Request



# 2002 NSAC Long Range Plan



## Scientific Opportunities are identified in all the major scientific areas of Nuclear Physics.

<u>Scientific area</u>	<u>Scientific Opportunities</u>
• Quark Structure	Upgrade of CEBAF to 12 GeV, R&D towards electron-ion collider
• Hot Nuclear Matter	Upgrade of RHIC's luminosity, involvement in LHC program
• Nuclear Structure	Proposed RIA, next generation Gamma-ray array
• Nuclear Astrophysics	Proposed RIA, neutrino measurements, underground lab
• Fundamental Symmetries	Next generation cold neutrons (at SNS), underground lab, RIA

## Recommendations:

- **The highest priority of the nuclear science community is to exploit the extraordinary opportunities for scientific discoveries made possible by these [previous] investments.**
  - Increased funding for research and facility operations is essential to realize these opportunities.
  - **Facility operations – university program – nuclear theory**
- **The Rare Isotope Accelerator (RIA) is highest priority for major new construction.**
  - RIA will require significant funding above the nuclear physics base. This is essential so that our international leadership positions at CEBAF and at RHIC can be maintained.
- **We strongly recommend immediate construction of the world's deepest underground science laboratory.**
  - An outstanding new opportunity to create this laboratory has emerged.
- **We strongly recommend the upgrade of CEBAF at Jefferson Laboratory to 12 GeV as soon as possible.**



# *Information for Budget Requests*

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## **NSAC Low Energy Review (November 2001):**

Charge: To review and evaluate current and future scientific capabilities in the area of nuclear structure and astrophysics ..... and make recommendations of priorities...

### Findings/Recommendations:

- Outstanding program of high impact science
- Need for balanced program: Utilization of existing facilities & preparing for RIA
- Constant effort funding (FY 2002 level) necessitates severe changes to address priorities.
  - Termination of 88-Inch Cyclotron and limiting R&D for RIA

## **Facility Operations Reviews of RHIC, TJNAF & HRIBF (Jan-March, 2002):**

Charge: To evaluate present performance and cost of operations, and what funding is needed to effectively support their research missions.

### Findings/Recommendations:

- Facilities well managed: resources were optimized: outstanding science produced
- FY 2002 funding levels limited operations and at levels that are not sustainable.
- Recommended funding levels above cost of living:

RHIC: ~+\$16-19M      TJNAF: ~+\$6.5-9M      HRIBF: ~+\$1M



# *Status of the FY 2003 Budget Request*

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## **President's Budget Request (\$382.4M ) provides ~ 6 % increase over FY 2002**

- House Appropriations: President's Request – General Reduction (~1%)
- Senate Appropriations: President's Request + \$5M (RHIC & CEBAF) – General Reduction (~1%)

## **Appropriations Bill has not been passed.**

- Continuing Resolution – until November 22 (spending at FY 2002 levels)
- Not clear when Appropriations Bill will be passed

	Request		
	<u>FY02</u>	<u>FY03</u>	
Research	125.8	131.0	(+ 4.1%)
Facility Operations	206.4	227.1	(+10.0%)
Stewardship	<u>18.4</u>	<u>24.3</u>	
	350.6	382.4	

## **Facility Operations support is increased by ~10% (+\$21M) over FY 2002**

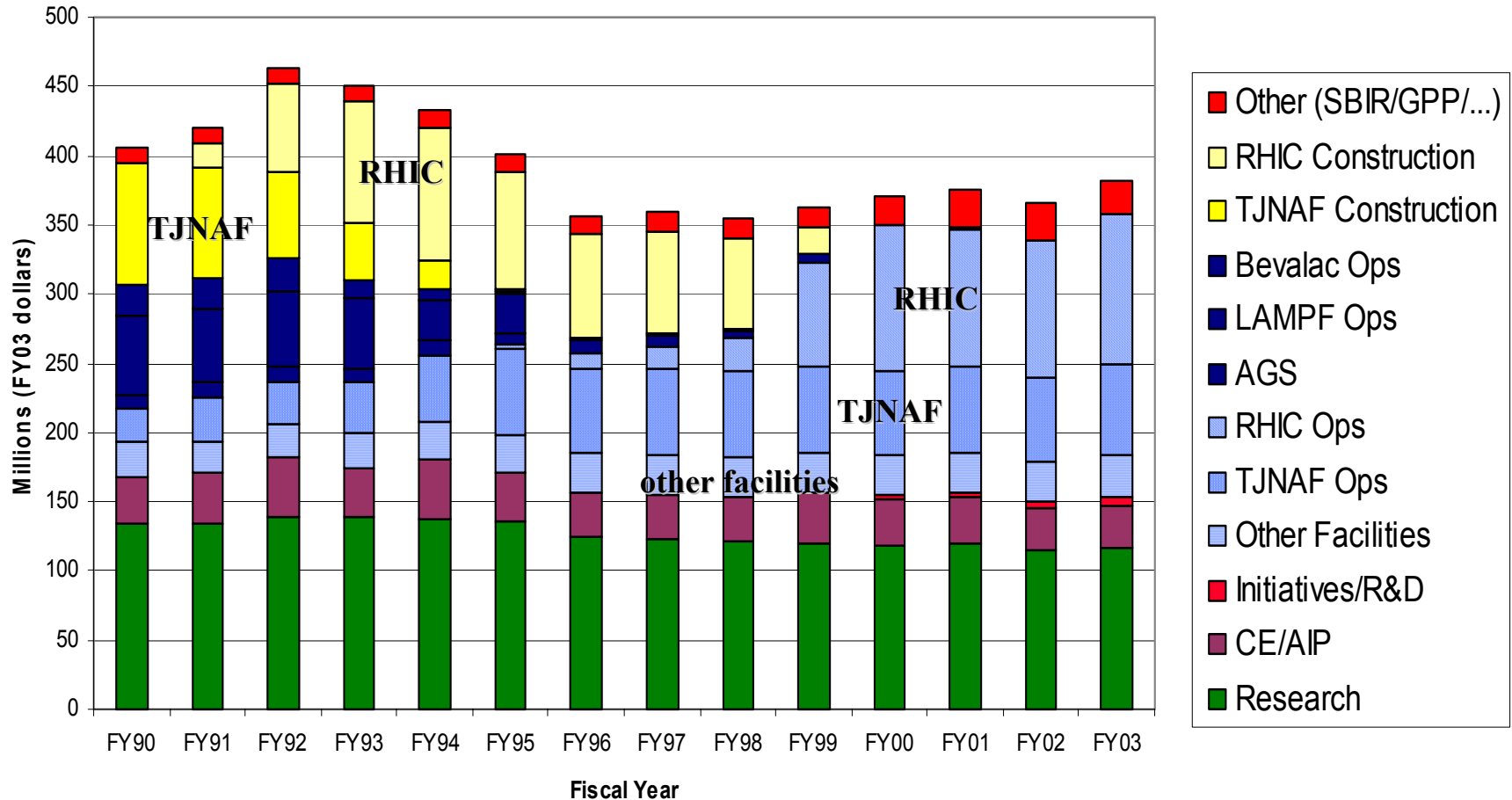
- Overall beam hours for research are increased by 18%.
- RHIC running schedule is doubled compared to FY 2002.

## **Research support is increased by ~4% (+\$5M) increase over FY 2002**

- Theory activities are enhanced by ~5% and enhanced support for RIA R&D.
- Efforts in experimental research & computing (SciDAC) are maintained.



# DOE Nuclear Physics Funding





# DOE Nuclear Physics Budget

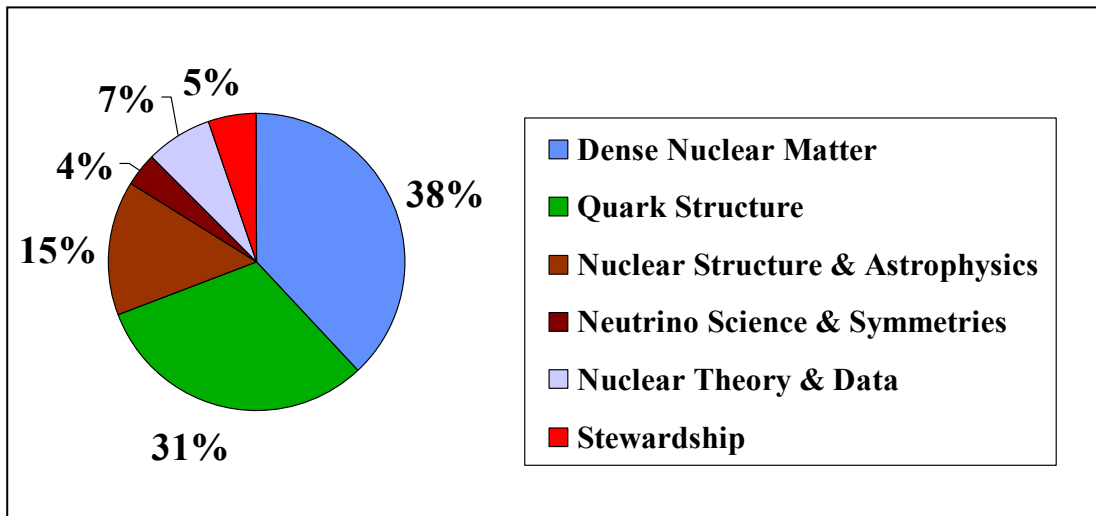
(Millions of Dollars)



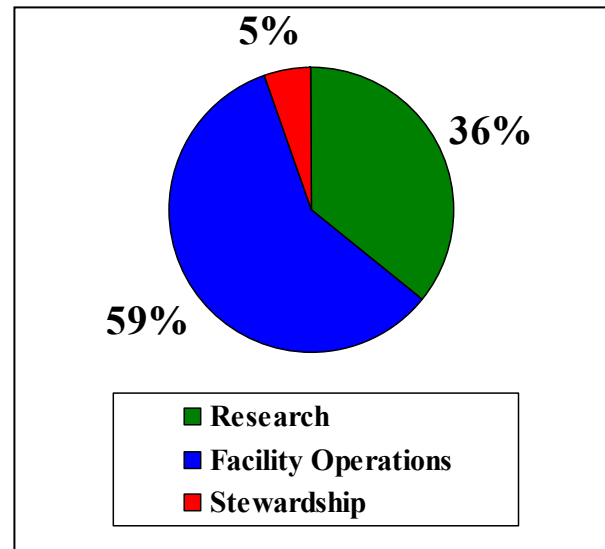
## Subprograms are aligned with Scientific Thrusts

<u>Subprograms</u>	<u>FY 2002</u>	
Medium Energy	111.6	Quark Structure
Heavy Ions	151.3	Hot Nuclear Matter
Low Energy	62.5	Structure/Astrophysics/Symmetries
Nuclear Theory	<u>25.2</u>	All NP areas plus Nuclear Data
	350.6	

### Two of the Scientific Thrusts Dominate the Budget



### Facility Operations Dominate Budget





# Status of the proposed Rare Isotope Accelerator (RIA) Project



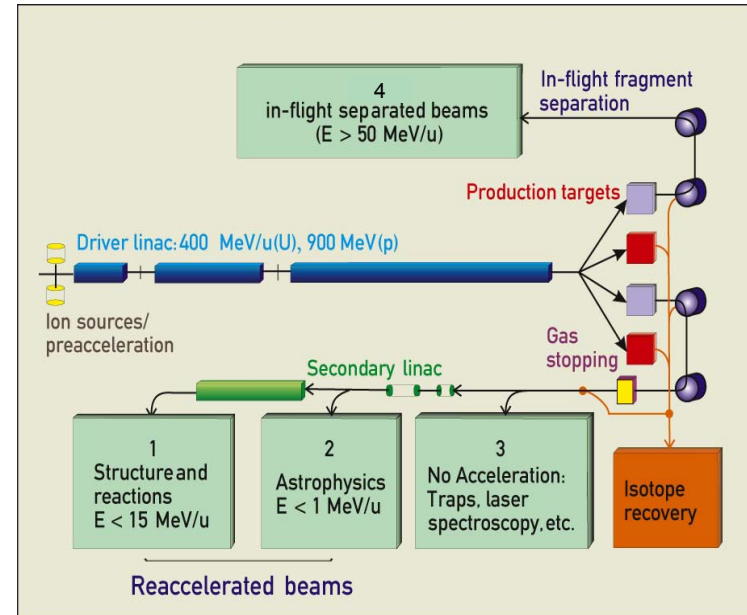
**2002 NSAC LRP recommends RIA as the highest priority for major construction.**

RIA's capabilities will make U.S. a leader in addressing three topics at the heart of fundamental nuclear physics:

- The nature of nucleonic matter
- The origins of the chemical elements
- Physics beyond the Standard Model.

A proposed RIB facility has been studied and supported by the community since 1995:

- NSAC 1996 Long Range Plan recommendation
- NRC 1998 Physics Survey recommendation
- NSAC 1999 Taskforce established RIA paradigm.



RIA R&D efforts are now in their third year. **No technical impediments have been identified.**

Workshops were held in 2002 on facility component R&D and a RIA Physics Summer School.

**Argonne National Laboratory (ANL)** and **Michigan State University (MSU)** continue to express interest in hosting RIA with support from their institutions and their States.

Office of Science and DOE have made no decision regarding construction of RIA.



# Status of Proposed CEBAF 12 GeV Upgrade

**2002 NSAC LRP strongly recommends the upgrade of CEBAF at TJNAF to 12 GeV as soon as possible.**

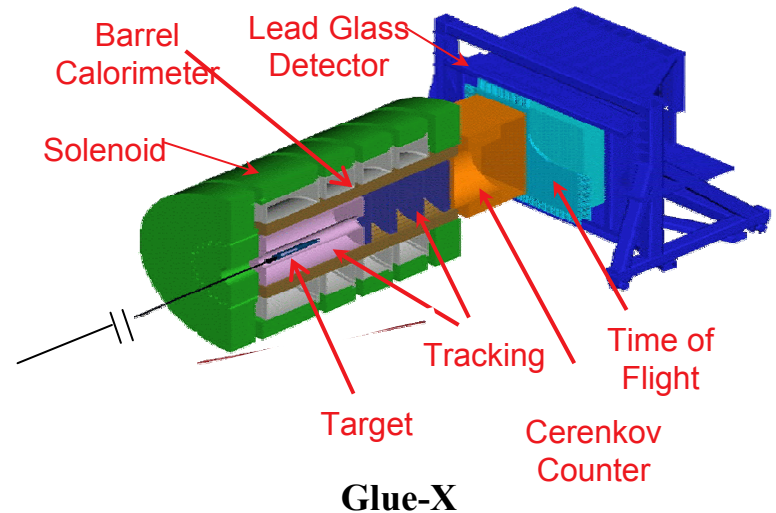
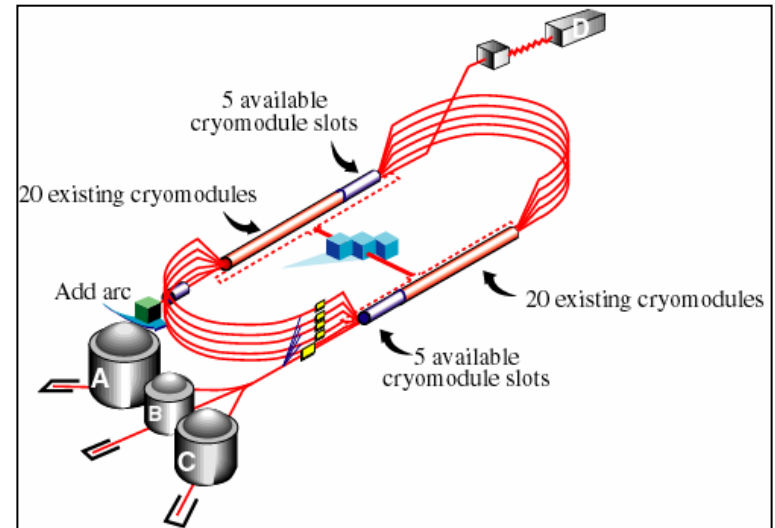
The upgrade will open the opportunity to:

- Address the question “What is the nature of quark confinement in QCD?”
- Map out the quark & gluon wave-functions of the nucleons
- Extend and complete ongoing studies of the transition from a nucleonic composition (nucleons) to a quark composition of nuclei.

Very cost-effective because of advancements in superconducting RF technology and the use of existing conventional facilities.

No technical issues identified.

Office of Science and DOE have made no decision regarding construction.





# *FY 2003: Nuclear Physics Division Activities*

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## **DOE FY 2004 Budget Request has been submitted to OMB**

- OMB passback expected after Thanksgiving
- Budget format revised to address OMB/OSTP R&D Investment Criteria Initiative

## **R&D Solicitations**

- Proposals for RIA R&D are under review: decisions expected by the end of calendar 2002
- Deadline for Outstanding Junior Investigator (OJI) proposals: November 6, 2002
- SC Early Career Awards for Scientists and Engineers: Watch NP website for notice

## **Office of Science (SC) is in the process of setting priorities for future facilities**

- House Appropriation language expressed support for facility investments (if priorities set)
- Nuclear Physics has submitted a 20-year plan (using guidance of NSAC Long Range Plan)
- SC Strategic Plan anticipated to be completed in early 2003

## **Reviews and NSAC**

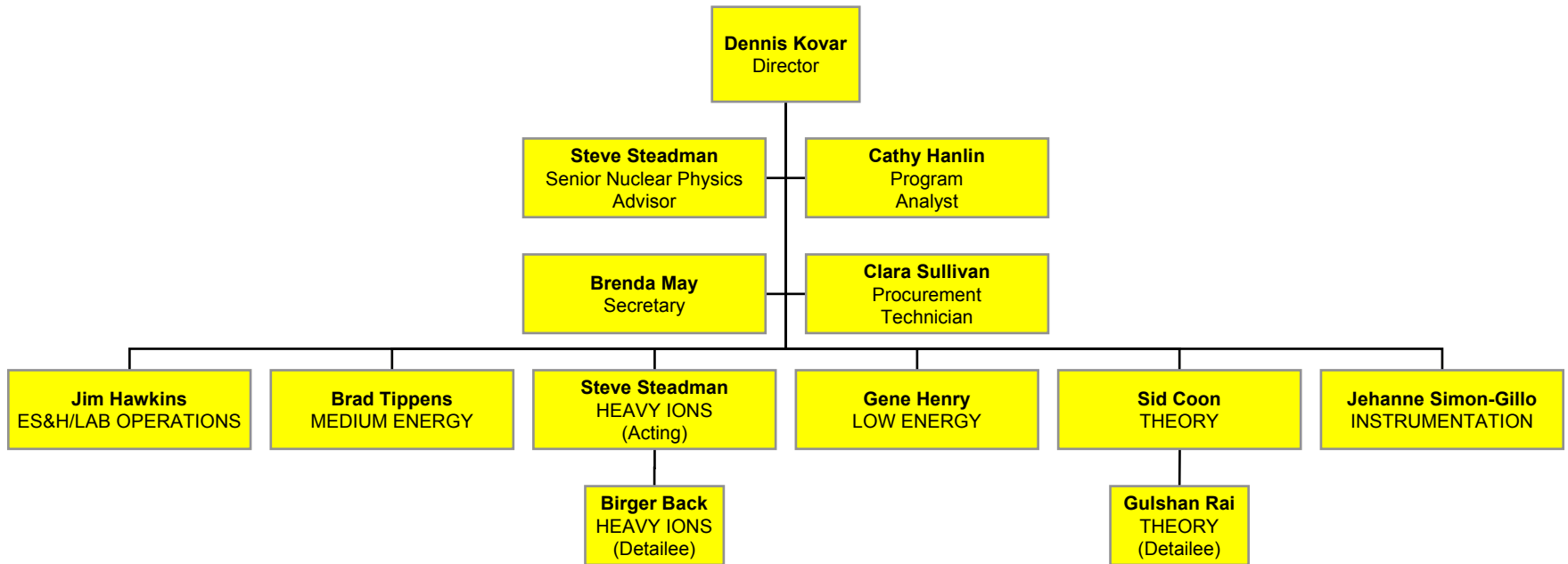
- Reviews of laboratory research and facilities being planned
- Anticipate that NSAC will be charged to perform reviews and provide guidance

## **Nuclear Physics Division is almost fully staffed**

- Sid Coon has joined the Division as Program Manager for Nuclear Theory
- Anticipate filling the Heavy Ion Nuclear Physics Program Manager position soon.



## NUCLEAR PHYSICS





# FY 2003 Nuclear Physics Budget Request

(Millions of Dollars)



	<u>FY01</u>	<u>FY02</u>	<u>Request</u> <u>FY03</u>	
<u>Research</u>				
Operating	112.8	113.3	116.8	
Capital Equipment	<u>11.1</u>	<u>8.1</u>	<u>8.7</u>	
	123.9	121.4	125.5	+ 3.4 %
RIA R&D	2.8	2.8	3.5	
Computing Initiative (SciDAC)	<u>2.0</u>	<u>2.0</u>	<u>2.0</u>	
	4.8	4.8	5.5	+ 14.6 %
<u>Facility Operations:</u>				
RHIC	104.0	103.3	117.5	(+ 13.7 %)
AGS	1.4	1.0	-	
TJNAF	66.7	67.2	72.5	(+ 7.9 %)
Bates	13.0	12.4	13.3	(+ 7.3 %)
LE Facilities	<u>21.7</u>	<u>22.5</u>	<u>23.8</u>	(+ 5.8 %)
	206.8	206.4	227.1	+ 10.0 %
<u>Stewardship:</u>	<u>24.5</u>	<u>26.4</u>	<u>24.3</u>	- 8.0 %
Nuclear Physics Total	360.0	359.0	382.4	+ 6.5 %



# *Discussion of possible NSAC Charges*

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## **Review of the Nuclear Theory Program**

- Identified in the 2002 NSAC Long Range Plan
- As part of the “validation of program directions” in Performance Measures

## **Review of the DOE Nuclear Data Program**

- Identified in the Workshop on Combating Terrorism
- Need to better understand the resource and manpower needs

## **Review of the Neutron Physics Program**

- Need to better understand the scientific priorities and impact of proposed programs

## **(Guidance on Implementation of the 2002 NSAC Long Range Plan)**

- Guidance on priorities and impacts of proposed programs/projects
- Programs/Projects include:
  - New: GRETA, GARBO, SNS Beamline, EDM (Electric Dipole Moment)  
R&D for RHIC II/eRHIC, Heavy Ion LHC program  
Underground Lab detector
  - Upgrades: HRIBF (2<sup>nd</sup> platform), LANSCE (detector upgrades)  
KamLAND (solar neutrino)  
RHIC (EBIS), RHIC (Detector upgrades)