U.S. Department of Energy

Office of Science

Nuclear Physics Program Budget FY 2009

Nuclear Science Advisory Committee

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Outline

- FY 2008 Appropriation
- FY 2009 Congressional Budget Request
- Outlook
- Office of Nuclear Physics

FY 2008 Appropriations

Continuing Resolution (CR) was in effect until December 28th

FY 2008 Appropriations for Office of Science (SC) is **$3,973 Million**

- This is **+$136.5 Million over** FY 2007 (including earmarks of $123.6 Million)
- This is **~$424 Million less** than the Congressional Budget Request ($4,397 Million)

FY 2008 Appropriations for Nuclear Physics is **$432.7 Million**

- This is **+$10 Million over** FY 2007 (+2.4%)
- This is **~$39 Million less** than Congressional Budget Request ($471.3 Million)

Office of Nuclear Physics
FY 2008 Appropriations

U.S. Department of Energy
Office of Science

(millions)

	FY06	FY07	Request FY08		Actual FY08	vs FY06	vs FY07
Research Operating	125.1	139.2	150.7		142.8	+ *14%*	+ *3%*
Research Cap. Equip.	8.5	12.4	19.2		14.1	+ 66%	+*14%*
<Research>	133.6	151.6	169.9	-13.0	156.9	+ 17%	+ *4%*
RHIC	116.4	135.5	146.5		136.0	+ *17%*	+ *0.4%*
CEBAF	65.3	70.4	78.3		70.2	+ *8%*	- *0.2%*
HRIBF	10.9	12.9	13.9		13.0	+ *19%*	+ *0.8%*
ATLAS	9.0	11.7	13.8		11.9	+ *32%*	+ *2%*
88-Inch Cyclotron	3.0	3.1	3.3		3.2	+ *7%*	+ *3%*
MIT/Bates	2.5	2.0	2.0		2.0		
<Facility Operations>	207.1	235.6	257.8	-21.5	236.3	+ *14%*	+ *0.3%*
12 GeV Upgrade R&D/PED	4.5	9.5	14.5		14.4		
EBIS (RHIC)	2.0	5.1	4.2		4.1		
<Construction>	6.5	14.6	18.7	-0.2	18.5	+*185%*	+*27%*
Other (GPP/SBIR/etc)	19.8*	21.0*	24.9		21.0		
<Stewardship>	19.8	21.0	24.9	-3.9	21.0	+ *6%*	
Nuclear Physics Total	367.0	422.8	471.3	-38.6	432.7	+ *18%*	+ *2%*
		+15.2%					

** Includes SBIR/STTR*

Impacts of FY 2008 Appropriation

U.S. Department of Energy
Office of Science

Nuclear Physics (NP); -$38,593,000 (8.2% below FY 2008 President's Request)

Stretch out of construction projects and MIEs and impacts to cost and schedule:

- Funding for the PHENIX FWD VTX, PHENIX NCC, GRETINA, and nEDM (DOE/NSF) reduced, increasing project risks and causing schedule delays. Impacts to project costs are being evaluated.
- Funding for EBIS (DOE/NASA) project at RHIC, which had been reduced in the FY 2007 Appropriation, is not restored in FY 2008. Funds requested in FY 2009 to complete the project.

Ongoing research program impacts:

- NP research programs will be nearly flat funded with FY 2007, resulting in reductions in effort due to inflation. Planned increases in research efforts that support ongoing initiatives, such as FNPB and LHC, are reduced. Generic R&D related to rare isotope beam capabilities is reduced.

Operating facility impacts:

- Relativistic Heavy Ion Collider (BNL) operations are reduced from planned 30 to 19 weeks.
- Continuous Electron Beam Accelerator Facility (TJNAF) operations are reduced from planned 34 to 24 weeks. Important experiments in the current 6 GeV science program are not completed prior to the shutdown for the implementation of the 12 GeV CEBAF Upgrade Project.
- Operations of the ATLAS and HRIBF are reduced. Efficiency improvements are deferred.

Impacts to new programs to be initiated in FY 2008:

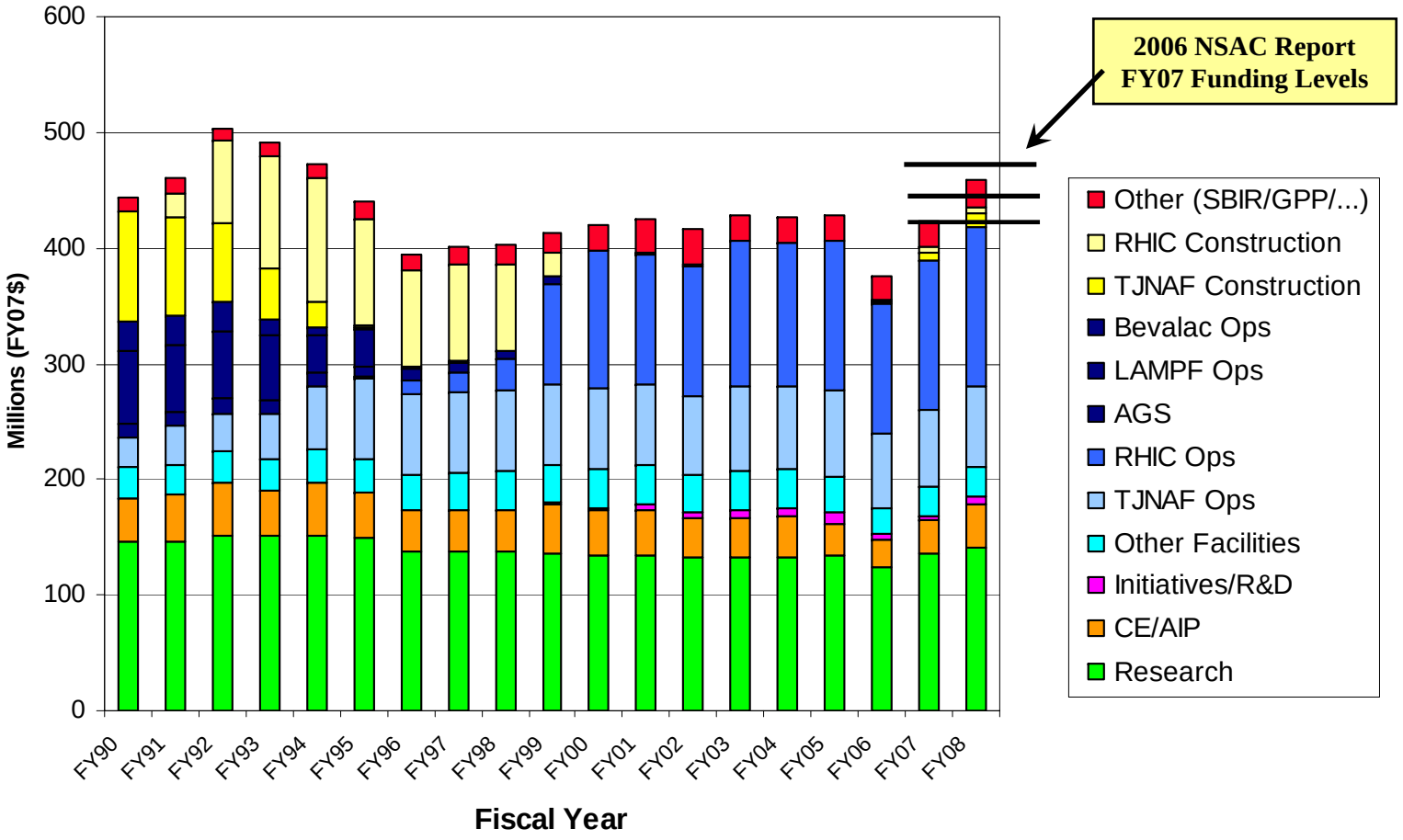
- Increased support for the Advanced Fuel Cycle initiative and theoretical topical collaboration is deferred.

Layoffs or increases to workforce:

- Loss of support across the program results in reductions of approximately 10 permanent Ph.D.s, 10 postdoctoral fellows, and 10 graduate students. Loss of support for ~ 30 Engineering/Technical/Administrative personnel.

Funding in recent years has been at about OMB COL

- Facilities (LAMPF and Bevalac) were phased out to operate the new CEBAF and RHIC facilities
- Funding is now marginal for continued operations of these two facilities
- NSAC's assessment in FY 2006:
  - Funding at $430 M (FY 2007$) or below – not sufficient to sustain operation of both major facilities
  - Funding at $450 M (FY 2007$) – can sustain operations of both – but with significantly curtailed programs
  - Funding at $475 M (FY 2007$) – should be able to mount a viable program – slow and without a FRIB



Office of Science
FY 2009 Congressional Budget Request

U.S. Department of Energy
Office of Science

Office of Science
FY 2009 Budget Request to Congress
(dollars in thousands)

	FY 2007 Approp.	FY 2008 Request	FY 2008 Approp.	FY 2009 Request to Congress	FY 2009 Request to Congress vs. FY 2008 Approp.	
Basic Energy Sciences	1,221,380	1,498,497	1,269,902	1,568,160	+298,258	+23.5%
Advanced Scientific Computing Research	275,734	340,198	351,173	368,820	+17,647	+5.0%
Biological and Environmental Research	480,104	531,897	544,397	568,540	+24,143	+4.4%
High Energy Physics	732,434	782,238	689,331	804,960	+115,629	+16.8%
Nuclear Physics	412,330	471,319	432,726	510,080	+77,354	+17.9%
Fusion Energy Sciences	311,664	427,850	286,548	493,050	+206,502	+72.1%
Science Laboratories Infrastructure	41,986	78,956	66,861	110,260	+43,399	+64.9%
Science Program Direction	166,469	184,934	177,779	203,913	+26,134	+14.7%
Workforce Dev. for Teachers & Scientists	7,952	11,000	8,044	13,583	+5,539	+68.9%
Safeguards and Security (gross)	75,830	76,592	75,946	80,603	+4,657	+6.1%
SBIR/STTR (SC funding)	86,936	——	——	——	——	——
Subtotal, Office of Science	3,812,819	4,403,481	3,902,707	4,721,969	+819,262	+21.0%
Adjustments*	23,794	-5,605	70,435	——	-70,435	——
Total, Office of Science	3,836,613	4,397,876	3,973,142	4,721,969	+748,827	+18.8%

* Adjustments include SBIR/STTR funding transferred from other DOE offices (FY 2007 only), a charge to reimbursable customers for their share of safeguards and security costs (FY 2007 and FY 2008), Congressionally-directed projects and a rescission of a prior year Congressionally-directed project (FY 2008 only), and offsets for the use of prior year balances to fund current year activities (FY 2007 and FY 2008).

Office of Nuclear Physics
FY 2009 Congressional Budget Request

U.S. Department of Energy
Office of Science

	(millions)			
	FY07	FY08	Request FY09	vs FY08
Research Operating	139.0	142.8	161.5	+ *13%*
Research Cap. Equip.	12.8	14.1	18.0	+ *28%*
<Research>	151.8	156.9	179.5	***+ 14%***
RHIC	135.5	136.0	148.6	+ *8%*
CEBAF	70.4	70.2	77.8	+ *11%*
HRIBF	12.9	13.0	14.6	+ *12%*
ATLAS	11.7	11.9	13.7	+ *15%*
88-Inch Cyclotron	3.1	3.2	3.7	+ *16%*
MIT/Bates	2.0	2.0	0	
<Facility Operations>	235.6	236.3	258.4	***+ 9%***
12 GeV Upgrade R&D/PED	9.5	14.4	28.6	
EBIS (RHIC)	5.1	4.1	2.4	
FRIB R&D	0	0	7.0	
<Construction (TPE)>	14.6	18.5	38.3	***+107%***
Other (GPP/SBIR/etc)	21.0*	21.0	33.8**	
<Stewardship>	21.0	21.0	33.8	+ *61%*
Nuclear Physics Total	422.8	432.7	510.0	***+ 18%***

** Includes SBIR/STTR **Includes Isotope Program*

FY 2009 Budget Request
Research

U.S. Department of Energy
Office of Science

millions

Research	FY07	FY08	Request FY09	vs FY08
Universities	62.3	63.2	67.7	+ *7%*
Laboratories	70.2	73.1	84.0	+ *15%*
SciDAC & LQCD	2.7	2.7	3.2	+ *19%*
Rare Isotope R&D	3.8	3.8	0	
Enhanced R&D for AFC	-	-	6.6	
Operating Subtotal	139.0	142.8	161.5	+ *13%*
Research Capital Equipment (TEC)				
GRETINA	3.9	3.9	2.0	
FNPB	1.5	1.5	1.5	
STAR TOF	2.4	0	0	
PHENIX Silicon VTX	1.3	2.0	1.2	
PHENIX Forward Vertex Detector	0	0.5	2.4	
PHENIX Nose Cone Calorimeter	0	0.2	1.2	
HI LHC	1.0	2.0	4.0	
nEDM	0.8	2.2	1.1	
CUORE	-	0.5	2.0	
University CE	0.9	0.9	1.0	
Laboratory CE	1.0	0.4	1.6	
Capital Equip Subtotal	12.8	14.1	18.0	+ *28%*
Research Subtotal	151.8	156.9	179.5	+ *14%*

Nuclear Physics Program in FY 2009

FY 2009 Budget Request for NP ($510.0M) allows for effective utilization of the program's scientific facilities and makes important investments for the future

- University and Laboratory research efforts are strengthened to effectively support and implement the nuclear physics program.
- User Facilities (RHIC, CEBAF, ATLAS and HRIBF) operations are increased.
  - RHIC is at 25 weeks
  - CEBAF is at 34 weeks
- Important instrumentation projects are continued.
- The 12 GeV CEBAF Upgrade Project initiates construction.
- Conceptual design and R&D for a facility for a facility for rare isotope beams is requested for FY 2009.
- Support is increased for advanced fuel cycle initiatives and theoretical topical collaborations.

FY 2007-2017 Nuclear Physics Program

In FY 2007 SC developed a plan assuming a doubling of SC funding in 10 years

In SC's 10-year plan NP would be able to implement a world-class program

- Operate/implement capabilities of the user facilities to achieve their scientific goals
  - 12 GeV CEBAF Upgrade project is completed
  - Upgrades of RHIC accelerator/detectors with luminosity upgrade
  - At ATLAS, HRIBF and elsewhere research capabilities developed for forefront programs
  - Proceed with construction of a rare isotope beam facility compatible with available funds
- Pursue promising high impact scientific opportunities
  - Participate in heavy ion studies at the higher energies of LHC
  - Start studies of nuclear structure with GRETINA
  - Start measurements of fundamental neutron properties at the FNPB at SNS
  - Participate in neutrinoless Double Beta Decay measurements
  - Utilize leading edge computers to make progress in nuclear physics
  - Accelerator R&D performed for next-generation nuclear physics research capabilities

SC's plan is revisited each year in budget formulation process

- Address changing out-year projections
- Address new projects/programs added/eliminated in that years budget formulation
- Address new high priorities established by SC/DOE/Administration
- Incorporate advisory committee input

Depends upon Congressional Appropriations

FY 2009 Budget Request

FY 2009 Budget Request for Office of Science: $4,722 Million

- This is **+$324 Million over** FY 2008 Request of $4,398 M (+7.4%)
- This is **+$749 Million** over FY 2008 Appropriations of $3,973 M (+18.8%)

FY 2009 Request for Nuclear Physics $510.0 Million

- This is **+$38.7 Million** over FY 2008 Request of $471.3 M (+8.2%)
- This is **+$77.3 Million** over FY 2008 Appropriations of $432.7 M (+18%)
  Including transfer of Isotope Program (~ $20 Million)

NP is at a Crossroad

- **NP is at a crossroads**
  - Last year of possibly implementing the President's American Competitive Initiative
  - No one knows what the position of the new Administration will be
  - FY 2006 was a dismal year for NP
  - FY 2007 and FY 2008 Appropriations were also difficult
    - Despite verbal support from Congress
    - Despite positive House and Senate markups of budget
  - FY 2009 Continuing Resolution will have a strong negative impact on the program and particularly operations of facilities

- **In FY 2008, we are at the level at which NSAC acknowledged that we could not afford to operate both of our major facilities.**

- **The case for long term basic R&D and the importance of the NP program must be made to Congress**

Recent Program Management Activities

OECD Global Science Working Group on Nuclear Physics (WGNP)

- Document what efforts/facilities/plans/collaborations exist for nuclear physics world-wide
- Provide a forum for funding agency officials and representatives of the organized scientific community to discuss future research directions in an international context.
- Develop a concise, policy-level report containing findings and recommendations regarding the evolution of nuclear physics during the next 10-15 years, and identifying the major opportunities for international cooperation.

- 13000 scientists and support staff
- 3000 graduate students
- Operating funding of about $2B (US) per annum.

Region	Theory Ph.D.	Experiment Ph.D.	Ph.D. students	Support	Totals
Europe	650	2260	1400	2210	6520
North America	350	1360	900	1150+	3760+
South America	70	100	120	100+	390+
Asia Pacific	~ 610	~ 1190	~ 520	300+	~2620
Total	~ 1680	~ 4910	~ 2940	3760+	13290+

Table 1. Data on Estimated size of Nuclear Physics Workforce

~ indicates that some data has been estimated

+ indicates that only partial data existed for some countries (so a lower limit)

Some OECD recommendations

- Free and open access to beam usage should continue to be the international mode of operation for nuclear physics facilities.
- The proposed new and upgraded facilities within the global roadmap for nuclear physics are well coordinated and will produce outstanding science and discoveries. Their implementation is recommended.
- It should be recognized that there are important roles for nuclear physics research facilities with a wide diversity in both size and type. As major new facilities are planned, an appropriate balance of facilities must be maintained.
- The nuclear science community, funding agencies, and professional societies should continue to encourage interactions to make nuclear scientists and the broader community more aware of how the insights and techniques of nuclear physics can be applied. The nuclear science community should increase its efforts to better articulate the relevance and benefits of nuclear physics to national needs and society.
- A forum should be established to discuss, on a regular and ongoing basis, national and regional science-based roadmaps and to articulate a global scientific roadmap for nuclear physics.
- The national agencies should work together with international organisations, such as the OECD Nuclear Energy Agency, the International Atomic Energy Agency, and the international science community, to create a more comprehensive international plan to acquire and curate nuclear data for the wider community.
- The establishment of a forum for nuclear physics funding agencies should be considered for discussing plans for new large scale facilities and for optimizing communication and cooperation at a global level.

NP Decadal Study

- **New decadal study of NP will be supported by DOE and NSF**
- **National Academies will conduct – benchmark the status of the field**
- **Will start in FY 2009**

FY 2008 Solicitations

U.S. Department of Energy
Office of Science

Planned FY 2008 Solicitations	**Deadlines**
• Annual new/normal University Grant Solicitation	November/anytime
• Outstanding Junior Investigators (OJI)	Closed
• Proposals for Generic Rare Isotope Beam (RIB) R&D	Closed
• Notice of interest in DUSEL R&D in cooperation with NSF/HEP	Closed
• Proposals for theoretical topical collaborations	Deferred
• Proposals for design/site of Facility for Rare Isotope Beams (FRIB)	April 2008 (Comment)
• Pre-proposals for rare isotope beam investments for forefront research	June 2008

Decisions on Advanced Fuel Cycle (AFC) R&D in FY 2008

- Selected proposals may be supported in FY 2008; new solicitation for FY 2009 – after appropriation

New initiatives in FY 2009

- Solicitation for AFCI for 2009 funding will await an FY 2009 Appropriation
- Solicitation for topical theory centers will await an FY 2009 Appropriation
- Solicitation for research isotopes will await an FY 2009 Appropriation

Rare Isotope Beam (RIB) Experiments

Planned process for proceeding with Rare Isotope Beam Experiments

- Initiative to allow U.S. researchers to participate in forefront rare isotope beam studies while FRIB is being constructed. (~$50M over ~ 8 years)

NP has issued a solicitation for pre-proposals in FY 2008 – closing date June 2, 2008 for pre-proposals

- Formal applications will be accepted only from pre-applicants encouraged to submit a formal application, due November 2008
- Criteria will be based on traditional considerations plus whether:
  - There is some particular outstanding scientific opportunity afforded by facility and U.S. investments
  - There is the opportunity for significant role by U.S. participants
  - The activity has relevance/impact on the planned U.S. FRIB facility and program
- The facilities with existing or planned forefront rare isotope beam capabilities include (but not limited to):
  - RIBF/RIKEN (Japan), ISAC/TRIUMF (Canada), FAIR/GSI (Germany), SPIRAL II/GANIL (France), etc.
  - As well as facilities in the U.S., such as the NSCL/MSU (NSF), HRIBF and ATLAS.

Solicitation for Facility for Rare Isotope Beams

- Draft Funding Opportunity Announcement for U.S. Facility for Rare Isotope Beams has been released and is available for public comment until April 15, 2008.
  - **Can access from the NP website**
  - **Questions and answers posted on web site**

- Follows overall approach of the successful FOA for the GTL BioCenters tailored to the needs of the scope associated with the establishment of a facility

- There is no FY 2008 funding associated with the award - identifies a site that can proceed with facility establishment. Future funding depends on Appropriation. FY 2009 Budget requests Conceptual Design support and R&D.

- Anticipate making a single award in 2008 – schedule for making a decision has slipped.
  - **Draft FOA issued in order to obtain public comment**
  - **Adequate comment period to ensure that the public has the time to digest and respond**
  - **Hope to be able to make decision in calendar year 2008**

- Peer review process is now being refined and started

Status of NP Projects

Project	TPC	Start	Complete	Status
GRETINA MIE	**$18.8 million**	**FY 2004**	**FY 2011**	**CD2b/3b**
FNPB MIE	**$9.3 million**	**FY 2004**	**FY 2010**	**CD3**
STAR TOF	**$4.8 million**	**FY 2006**	**FY 2009**	**NA**
nEDM MIE (NSF)	**$17-19 million**	**FY 2007**	**FY 2015**	**CD1**
PHENIX SVT MIE	**$4.7 million**	**FY 2007**	**FY 2010**	**NA**
HI LHC ALICE MIE	**$13 -16 million**	**FY 2007**	**FY 2012**	**CD2/3**
PHENIX FVTX	**$4.95 million**	**FY 2008**	**FY 2011**	**NA**
PHENIX NCC	**$4.7 million**	**FY 2008**	**FY 2011**	**NA**
CUORE (NSF)	**$8-10 million**	**FY 2008**	**FY 2012**	**CD1**
EBIS (NASA)	**$14.8 million**	**FY 2006**	**FY 2010**	**CD2/CD3**
12 GeV Upgrade	**$310 million**	**FY 2004**	**FY 2015**	**CD2**

All projects are reviewed monthly, quarterly, annually

Nuclear Physics Office Reviews

Second Quarter 2008 Reviews:	**Dates**
• California Rare Ion Beam Upgrade Review	January 24-25, 2008
• STAR HFT Science Review	February 2008
• Fundamental Neutron Physics Beam-line Review	February 11-12, 2008

Future FY2008 Reviews	
• Injector for Radioactive Ion Species 2	April 15-16
• Heavy Ion Laboratory Research Review	*Week of May 12
• Outstanding Junior Investigator Proposal Panel Review	April 1
• HRIBF Science and Technology Review	*May/June
• TJNAF Science and Technology Review	June 30-July 2
• RHIC Science and Technology Review	July 7-9
• ATLAS Science and Technology Review	TBD
• 12 GeV Independent Project Review	July 22-24
• PHENIX NCC Science and project reviews	TBD
• KATRIN Annual Review	TBD
• nEDM Annual Review	TBD
• CUORE Independent Project Review	TBD
• Isotope Workshop	Summer
• FRIB peer review	TBD

*Days to be determined

NP and Isotopes Program

- The FY 2009 President's Request proposes to transfer the Isotope Production Program from the Office of Nuclear Energy to the Office of Science: Office of Nuclear Physics.
  - The program is renamed the Isotope Production and Applications Program
  - Includes Isotope Production Infrastructure and a new initiative entitled Research Isotope Development and Production – priorities will be defined via peer review

- NP program has the expertise and experience in operating facilities and developing technologies that are relevant to the production of stable and radioactive isotopes. Transfer will allow the strengthening of synergy between the two communities and opportunities for new collaborations.

- With the exception of the research isotope initiative, the FY 2009 request is cut and paste from the NE budget framework.

- Ultimate responsibility of the Isotope Program resides with NE until there is an Appropriation, but FY 2010 and outyear budget formulation resides with SC/NP.

- NP is working closely with SC and other stakeholders in anticipation of the transfer.

Transfer Isotope Program from NE to SC

Planning for transition to Nuclear Physics has begun

- Isotope staff (2 FTE) will transfer from NE to NP
- Assets such as facilities, inventories, and account receivables
- Commitments, Memorandum of Agreement/Understanding (e.g. NNSA for He-3) and isotope supply contracts
- Re-consider isotope pricing policy, especially for research isotopes
- Communicate with federal agencies involved in isotope production
- Develop a strategic plan for program – involve stake holders and community; Workshop is being organized for the summer
- Identify what role NP facilities and researchers can play in development and production of isotopes – strengthen lines of communication
- Establish peer review mechanisms for facilities in Isotope Program
- SBIR/STTR
- Establish peer review mechanism for research isotopes – anticipate that NSAC will play a role – NuSAG model is being considered
- Establish Working Group with NIH to address NAS study recommendations

Advancing Nuclear Medicine Through Innovation NAS Report September 20, 2007

U.S. Department of Energy
Office of Science

Some NAS Committee Report Findings and Recommendations

- The DOE-NE Isotope Program is not meeting the needs of the research community because the effort is not adequately coordinated with NIH activities or with the DOE-BER).

- Public Law 101-101 (requiring full cost recovery) – is an impediment to radioisotope availability. (P.L.101-101 was modified by Public Law 103-316)

- There is inadequate domestic supply of most medical radionuclides for routine use in nuclear medicine practice, and no domestic source for some.

- Deteriorating infrastructure and loss of federal research support are jeopardizing the advancement of nuclear medicine.

- There is no short- or long term programmatic commitment by any agency to funding basic science (chemistry, physics and engineering) research and associated high-technology infrastructure (accelerators, instrumentation and imaging physics), which are at the heart of nuclear medicine technology R&D.

NP Staff

Changes in Office of Nuclear Physics (NP)

- Several positions now approved for FY 2008
- Technical Advisor position about to be advertised
- Program Manager Positions:
  - **Low Energy Program Manager position advertised – position offered**
  - **Theory Program Manager position vacant and about to be advertised**
  - **Facility Operations and Major Initiatives about to be advertised**
- Detailee/IPA positions
  - **Facility Operations Detailee – John D'Auria (ORNL / Simon-Frasier University)**
  - **We do have openings - please contact myself or Gene Henry**

Office of Nuclear Physics

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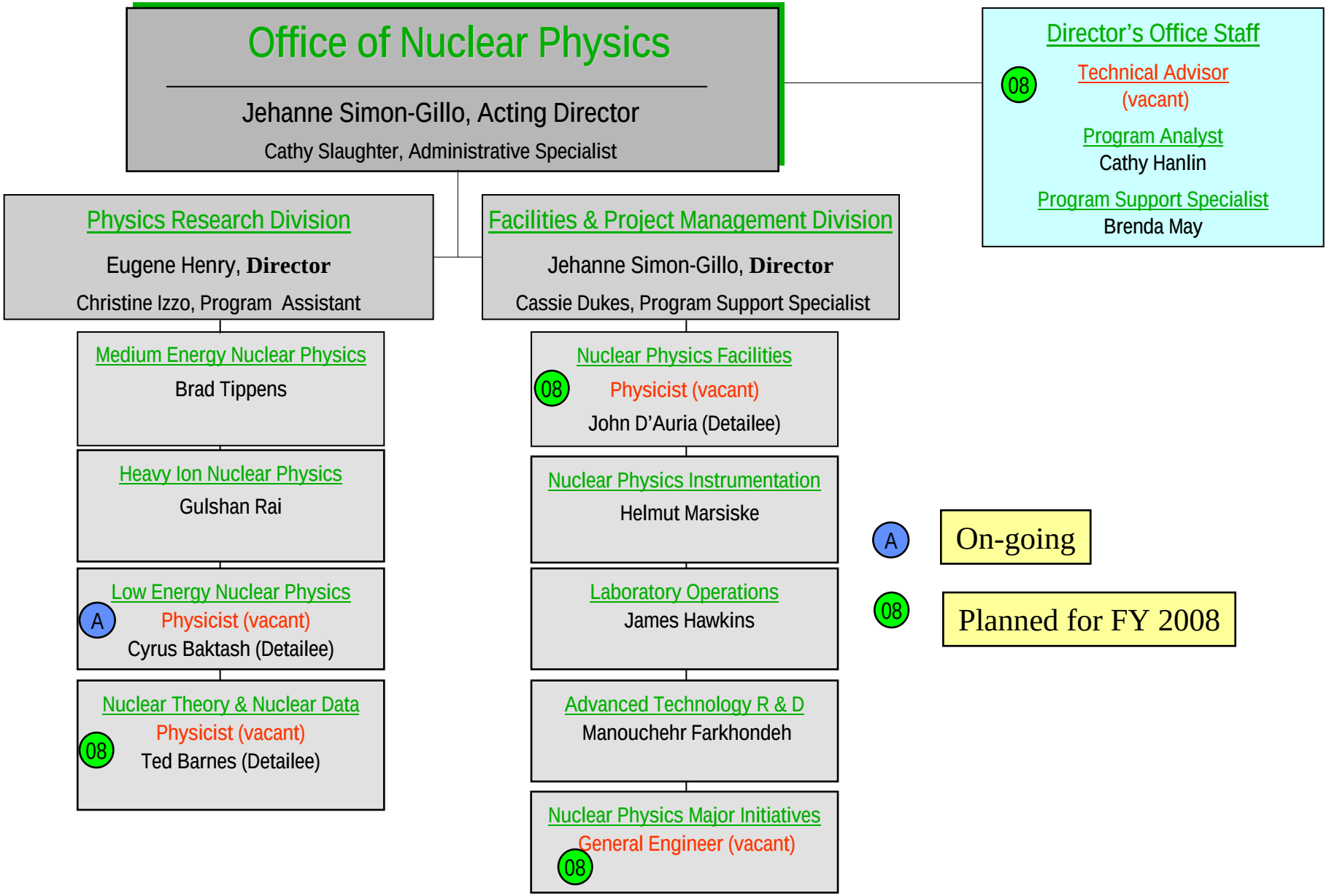


August 2007

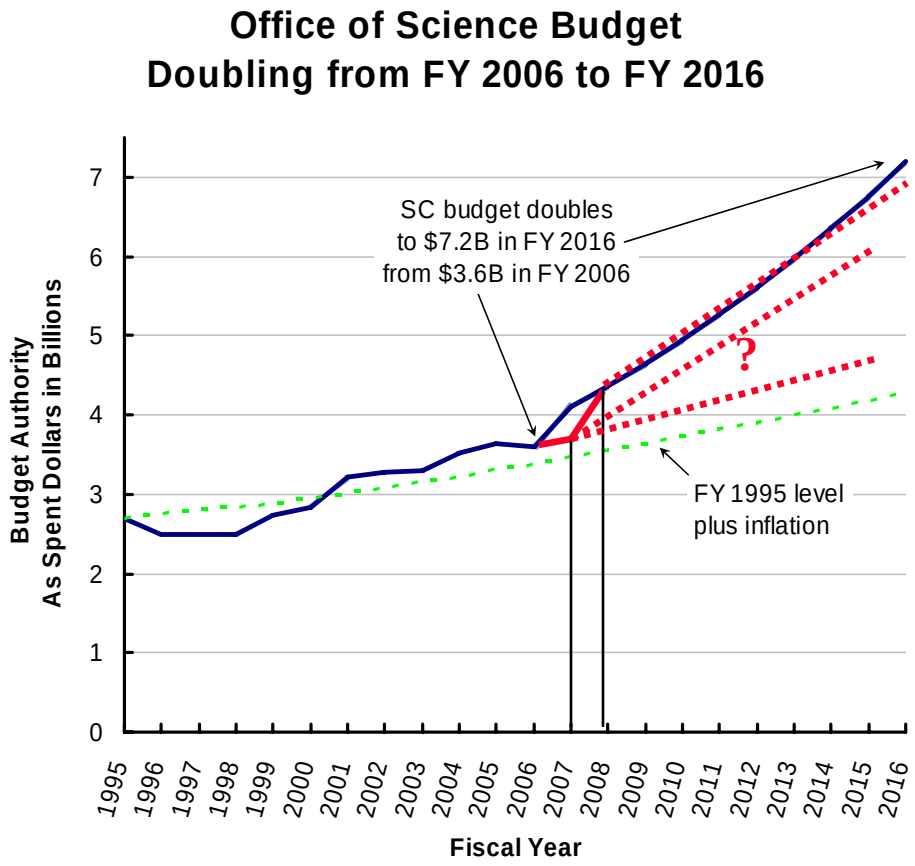
Backups

FY 2009 is a very important year (President's American Competitiveness Initiative)

U.S. Department of Energy
Office of Science

"We must continue to lead the world in human talent and creativity. Our greatest advantage in the world has always been our educated, hardworking, ambitious people -- and we're going to keep that edge. Tonight I announce an American Competitiveness Initiative, to encourage innovation throughout our economy, and to give our nation's children a firm grounding in math and science."

"First, I propose to double the federal commitment to the most critical basic research programs in the physical sciences over the next 10 years. This funding will support the work of America's most creative minds as they explore promising areas such as nanotechnology, supercomputing, and alternative energy sources."



Last chance for implementing ACI