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# FY2007 Presidential Budget Request for Office of Science High Energy Physics

## Presentation before HEPAP

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# The DOE HEP program in FY 2007

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- Overall HEP budget and priorities in FY 2007:
  - Tevatron and B-factory supported for full scheduled operations
  - LHC Support (Operations and Computing) up 8% as construction completes
  - Core research program at the universities (6%) and laboratories (2%) increased
  - Initiatives for the future of HEP:
    - ILC R&D doubled (\$30M→\$60M)
    - Start of new neutrino initiatives
      - Electron Neutrino Appearance Experiment (EvA)
      - Reactor Neutrino Detector
    - Investment in long-term accelerator R&D increased \$28M→\$33M
    - Dark Energy R&D increased \$3M→\$13M

# High Energy Physics FY 2007 Budget

(\$M)

		FY05 Actual	FY06 Approp.	FY07 Request	FY07 - FY06
Facility ops	Tevatron	234	215	215	0
	B-factory	108	93	93	0
	LHC (construction+ops)	62	60	60	0
	LBNL and BNL infrastructure	6	6	6	0
Other Projects	Construction and non-LHC MIEs	17	2	13	11
<b>Subtotal ops &amp; projects</b>		<b>427</b>	<b>376</b>	<b>387</b>	<b>11</b>
core research	University physics research	104	104	110	6
	Laboratory physics research	85	83	85	2
	Accelerator Science (univ + lab)	28	28	33	5
	SciDAC & Lattice QCD	7	7	7	0
<b>Subtotal core research</b>		<b>224</b>	<b>222</b>	<b>235</b>	<b>13</b>
	Accelerator Development	24	28	28	0
	Detector R&D	14	20	14	-6
	ILC R&D	24	30	60	30
	Dark Energy R&D	3	3	13	10
	Neutrino R&D	0	9	4	-5
<b>Subtotal R&amp;D and new initiatives</b>		<b>65</b>	<b>90</b>	<b>119</b>	<b>29</b>
<b>Others (incl. SBIR/STTR in 06 and 07)</b>		<b>7</b>	<b>29</b>	<b>34</b>	<b>5</b>
<b>Total as shown in FY07 budget</b>		<b>723</b>	<b>717</b>	<b>775</b>	<b>58</b>
SBIR/STTR in FY 2005		17			
<b>Grand Total incl SBIR/STTR</b>		<b>740</b>	<b>717</b>	<b>775</b>	<b>58</b>

# ILC R&D

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- To support a U.S. leadership role in this coordinated international R&D effort, DOE is doubling the ILC R&D budget in FY2007 Presidents Request (\$30M→\$60M)
  - Enables progress on major subsystems
  - Begins industrialization of key components so that U.S. industry can get “up to speed” and successfully compete for contracts if ILC is built
  - Includes detector R&D funding (a change from previous years)
  - Also includes U.S. contributions to GDE management & support
- This is an important step forward for the ILC effort, although it is NOT yet
  - Approval of construction, or engineering design
- The goal of the R&D program at this stage is to provide solid technical, cost and schedule information to governments to support a future decision on ILC construction.

# Core Research

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- We are supporting core experimental and theoretical research at labs and universities to maintain approximately the FY 2006 level-of-effort, or slightly above:
  - **University-based physics research up ~6% overall**
  - **Lab-based physics research up ~2% overall**
- **Goals:**
  - To maintain strong participation in the **Tevatron, B-factory** and **LHC** physics programs
  - To help support **research** activities associated with new initiatives such as ILC R&D, neutrinos, dark energy, and dark matter (though most R&D funding for these activities comes from other sources).
  - Also includes ongoing (unchanged from FY06) HEP contributions to the cross-cutting **SciDAC** program and the **Lattice QCD** IT investment, joint with Nuclear Physics.

# New Neutrino Experiments

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- APS Study *The Neutrino Matrix* recommended several new experiments in neutrino physics, including:
  - Reactor experiment to measure  $\theta_{13}$  via  $\nu_e$  disappearance
  - Accelerator-based experiment with comparable sensitivity to  $\theta_{13}$  as above AND sensitivity to mass hierarchy thru matter effects
- Charge to Neutrino Scientific Assessment Group (NuSAG) in 2005 explicitly asked for further recommendations on which of the possible technical options to pursue in these two areas.
- We are proceeding in the FY2007 request with these two experiments:
  - **Reactor Neutrino Detector.** Site to be determined. Awaiting NuSAG assessment of experiments.
  - **Electron Neutrino Appearance (EvA) Experiment.** Very large scintillator detector to observe  $\nu_e$  appearance.
- R&D for other items in the list of APS recommendations is proceeding (see later slide), in coordination with DOE Nuclear Physics and/or NSF

# Accelerator R&D

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- In addition to increases in ILC R&D, there is in the FY2007 request an **additional significant increase (+\$5M, or ~18%) in the long-range R&D program that supports fundamental research into the physics of beams and accelerator technologies (“accelerator science”)**
- The goal is to enable the restoration of the accelerator science research program to the level needed to support long-term R&D on new particle acceleration techniques and technologies, such as:
  - **Novel particle acceleration concepts**
  - **New superconductors and their application**
  - **Very high gradient accelerating structures**
  - **Advanced beam instrumentation**
  - **Theory and simulation of beams**
  - **User facilities to test these concepts**
- This research has, in the past, benefited all of the accelerator-based Office of Science research and will likely continue to do so in the future
- Advice from the community (e.g., J. Marx AARD panel) provide needed input for developing this program

# Other New Initiatives

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- Progress on other experimental initiatives (not an exhaustive list)
  - A high intensity neutrino beam for neutrino CP-violation experiments
    - R&D continues; technical evaluation
  - A neutrinoless double-beta decay experiment to probe the Majorana nature of neutrinos
    - 200kg Xenon experiment in operations by 2007
    - R&D underway for large-scale (~1000kg) experiments with various isotopes (with DOE Nuclear Physics, and possibly NSF)
  - An underground experiment to search for direct evidence of dark matter
    - R&D for next-generation experiments, joint with NSF
    - Dark Matter Scientific Advisory Group (SAG) to be discussed here
  - Ground-based dark energy experiment(s)
    - R&D for new cameras on existing telescopes and/or new telescopes
    - In cooperation with NSF, based in part on DETF input
  - Space-based dark energy experiment(s)
    - SNAP R&D continues as conceptual design for Joint Dark Energy Mission with NASA
    - R&D on other approaches will be considered